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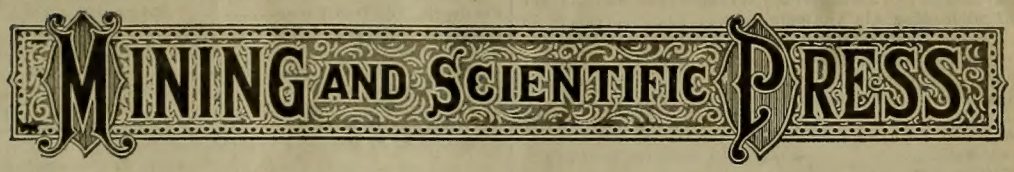

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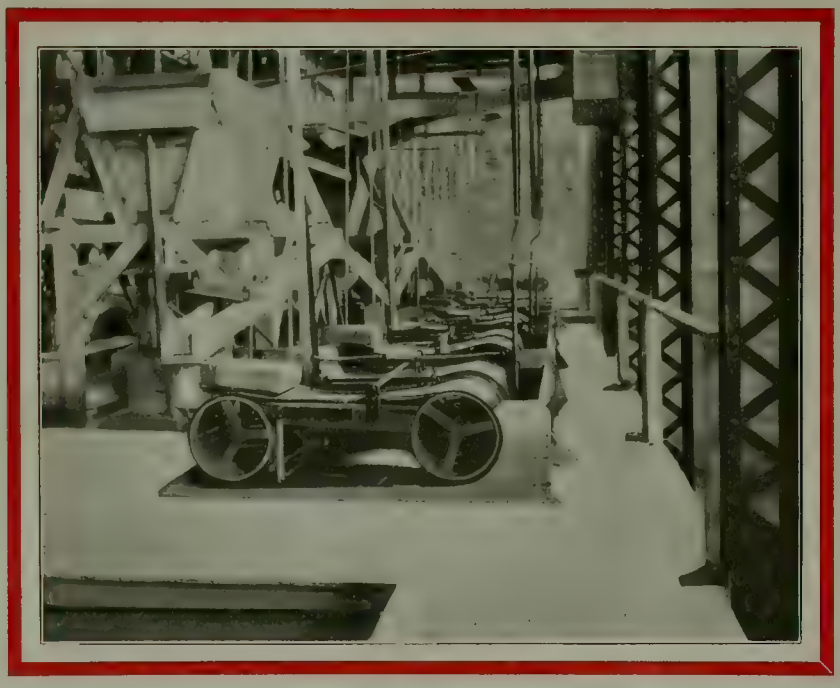

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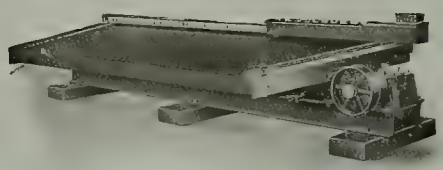

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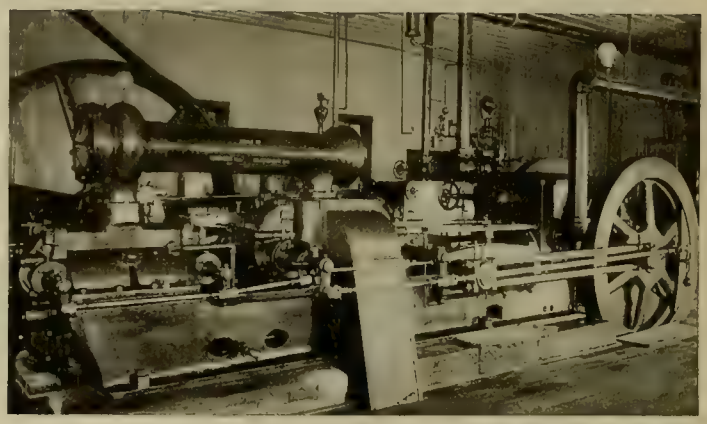

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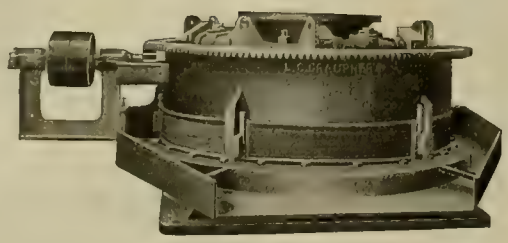

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Editorial.

MEXICAN domestic difficulties must not be judged too hastily from press dispatches. News from the border is always generated at high tension; the voltage is out of proportion to the amperage. The Mexican Government is no more likely to fall to pieces than that of the United States at the time of the Chicago riots. One needs to be abroad and read the dispatches from home at such a time to appreciate what allowance must be made for journalistic exaggeration. It is hard for the average news-gatherer to damage the potentialities of a thrilling story by giving all the details. From the most reliable data now available, the Mexican flurry seems to be a result of hard times, lack of employment, and physical suffering from actual want. A comprehensible sentiment has led even to a demand that foreigners be dismissed from the State-controlled railways to make room for starving Mexicans. There may be more logic than revolution in the recent disorders. Until more sober information arrives, it is best to suspend judgment. At any rate, the authorities seem to have the situation well in hand, and there is no danger in the Republic for the man who minds his own business as he should.

Grover Cleveland.

GROVER CLEVELAND, ex-President of the United States, passed away at his home in Princeton, New Jersey, on June 24. The centre of violent political controversy while at the height of his public career, he became the repository of a nation's respect and confidence when he laid aside the cares of state. For sane balance of work and recreation, for the adornments of culture, and by manly criticism and suggestion untinctured by party bias, he has set an example worthy of emulation by all the citizens of a republic. Mr. Cleveland was not simply greater than party; he not only did not dominate a faction for his political aggrandizement; he practically dispensed with party, and rose to power on the people's favor, despite the politicians. He distinguished himself above all others in giving practical effect to civil service reform. While personally desiring the annexation of Hawaii, he withdrew from the Senate the treaty drafted for that purpose, because the de facto government offering annexation owed its existence to an armed invasion by forces of the United States. His Venezuelan message, so often referred to as an example of jingoism, in the light of subsequent events is seen to have been based upon motives of justice similar to those which prevented his acquiescence in dishonorable annexation schemes. That Anglophobia had no part in his famous act soon became clear to England also, when Mr. Cleveland, through his Secretary of State, negotiated a

general arbitration treaty on the broadest lines with Sir Julian Pauncefote, the British Ambassador. The highest tribute ever paid to his capability and honesty consisted in the abatement of anxiety over the probable outcome of the Equitable Life Assurance Society's troubles when he was named as one of its trustees. Public confidence was instantly restored, and a calamity which threatened to shake the foundations of our institutions of credit, was averted. Such was the power of one simple citizen in whom the people trusted.

The Curse of Potosí.

THE genially scrupulous Diedrich Knickerbocker began the History of New York with the creation of Adam in the Garden of Eden. Thus all the circumstances leading to the invasion of the Manhattan solitudes by the Hon. Peter Stuyvesant were presented in such array of logical sequence as to compel conviction of its inevitableness. In like playful spirit, and with a sly wink at the necessitarians such as Washington Irving might have tossed at the picture of Jonathan Edwards on his study-wall, Mr. J. H. Curle demonstrates, as appears in a letter printed elsewhere in this issue, that the accession of Theodore Roosevelt to the Presidency of the United States is traceable as a direct consequence from the discovery of Peru by Francisco Pizarro in 1528, and the opening of the wonderful treasure-mountain of Potosí in 1545. Quaint though this suggestion be, it is worth while to fall into such reflective mood in the presence of stupendous facts of nature which have profoundly influenced the destinies of men and nations. Mr. Curle, confronting the great metalliferous cerro in Bolivia, sees a chain of growth through industry quickened by the silver stream that poured from this wonderful mountain into Spain and thence to the manufacturing cities of Europe. Nothing like Potosí has ever been witnessed in the world before or since. An ancient Spanish chronicler, attempting to convey an impression of the vastness of this silver treasure, represented the mountain as a cone with a vent on top like an ant-hill, with cargo-men as thick as ants crowding in and out, and others digging the silver from the cavernous interior.

The effect of Potosí did indeed extend to the colonies of England in North America. If Spain had reached a higher state of development before this wealth was poured into her lap she might have employed it to build up industry at home. Instead she acted the part of a spendthrift, buying what she should have produced herself. Thus unconsciously she gave aid and comfort to her enemies, and hastened the destruction of her unstable power. Mr. Curle does not repeat the error of the late Lord Salisbury, who called Spain a decadent nation. With more correct appreciation of the truth he says, "the Spanish people during this period could not have been the greatest people in the world—they were only the richest." He might have added that they were at once the richest and the least prosperous. It was a curious destiny that kept Spain for seven hundred years the out-post guard of Europe against the Saracen, only to quench her victorious spirit in a flood of unearned riches from the New World, before opportunity had come for developing a self-conscious national life through those well-knit energies which result from normal industry and economic struggle. There has run through the world a Gallic spirit of culture, an Anglo-Saxon spirit of development of natural resources, a Germanic spirit of scientific enquiry, but from Spain have come chiefly melody and romance, the beautiful things of national childhood. The *cancion* sung to the plaintive chords of the guitar, the fables of El Dorado and the Fortunate Isles, the daring of unknown dangers with ships burned behind, the clash of arms, and miraculous victories—these come to mind when Spain is mentioned, while France suggests the loom and the atelier, England the smithy, and Germany the laboratory. Charles the Third, who came so near being Charles the reformer, deliberately undertook to dam up the silver river from Potosí in its course by a tariff-wall around his beloved Spain. But the way to make a protective-tariff tax the foreigner had not been revealed to the Spanish statesman. The people were recalcitrant. The dam was too high for its width of base, and it overturned. Not until Spain lost her colonies did reason and prudence change the ruinous policies derived from the prodigal days when the mines of Potosí emasculated the moral force of her people. The youthful dream of fortuitous wealth could not be dissipated while colonies remained to be exploited. The exchequer was always exhausted, and an impending mountain of debts ever threatened destruction. Whether Premier Praxedes Sagasta, foreseeing the possibility of deliverance, craftily precipitated the Spanish-American war or not, certain it is he was not averse to it, and he welcomed its inevitable consequences. After the first shock was over, the wholesome reaction came. The liberal minister of finance, Señor José Echegaray, for the first time in more than a century was able to display to the Cortes a surplus instead of a deficit, and for the past five years the national finances have been conducted on a similarly happy basis, while private industry, outside of agriculture, has been thriving at a rapid rate as compared with conditions in the past. The effort to absorb the industrious Hollander, so as to keep more of the silver of Potosí at home, proved futile. It only made more reformers and fighters, and helped to build up prosperous Puritan New England, and pave the way for Theodore Roosevelt—according to Mr. Curle. Charles III could not dam the stream at the frontier; the Duke of Alva could not hold the Lowlands, whither so large a part of the stream was determinedly flowing. But Roosevelt on San Juan hill could help to liberate Spain from the lingering remnant of the curse of Potosí. Not even the mining industry can thrive on extravagant bonanzas. As recently seen at Goldfield, high-grade ore leads to 'high-grading', to wide-spread moral perversion, to waste and dissipation. Moderate reward for intelligent effort is the foundation of true success. The mining world is no exception to the rule, and Potosí, hindering the development of a strong people for centuries, is a striking case in point.

Mining Claims on Forest Reserves.

MINING in its relation to the national forest reserves is coming to be a question of large importance. In our last issue we published a memorial from Montana protesting against the narrow construction which the forest reserve officials have placed on our mining laws, and the attitude of apparent hostility manifested toward mining interests situated within these reserves. It is not Montana alone which has cause for protest. In most of the mining counties of California like grievances exist. We appreciate that some of the criticism emanates from those who have found it no longer possible to pervert the mining laws to the acquisition of lands for purposes foreign to the legitimate extraction of mineral from the soil, but, on the other hand, specific instances have come to our knowledge which would seem to indicate that certain of the forest reserve officials were becoming over-zealous in their endeavor to establish records for themselves. Many of the rangers detailed to examine and report on the character of the land embraced within mineral applications have no proper qualifications for rendering fair and intelligent reports. They are innocent of practical experience in mining, and are often unable to find the claims. The special knowledge of a surveyor and of a mining engineer are required of the rangers in such cases, and through lack of such knowledge the claimant suffers. Recently, a ranger filed an adverse report because he was not certain as to the exact location of the boundaries of the claim in question, and, at the same time, admitted that he thought the land was probably mineral in character, but protested it "in order to be on the safe side." Under such circumstances the claimant is put to the expense, delay, and annoyance of a hearing because of an official's ignorance.

Another serious difficulty has arisen since the creation of forest reserves. In recent years the Land Department has been most rigorous in compelling conformity of placer claims to legal subdivisions of the land. The rule has frequently been forced to a ridiculous extreme. Even where the placer deposits are confined to comparatively narrow and limited territory along a stream-bed, the claimant has no alternative but to amend his location and embrace a contiguous territory which may have absolutely no value for mining purposes. Many cases have come to our attention where, after conforming their claims as required by the Land Department, the claimants find their application for patent protested by the forest service on the ground that the non-mineral territory which had been included under compulsion was declared more valuable for timber. They avoid Scylla only to be engulfed in Charybdis. A forest supervisor in the northern part of California says that the majority of the protests filed in his district have arisen through conflicts of this nature.

Another radical defect in the forest reserve system as applied to mining is that there is now no provision for acquiring a patent title to a mill-site in a forest reserve. As soon as the non-mineral character of the mill-site is established, the land comes within the operation of the forest reserve act, and it is impossible to acquire a fee-simple title to it. In this respect, the forest reserve act has nullified the mining laws. Often a mine operator can place his mill on his mining claim, but there are cases where the only suitable site is some distance away on non-mineral ground. While there is provision in the forest reserve regulations for leasing a site for milling purposes, this leaves an operator at the mercy of the forest officials, even as to the rental to be paid, and the tenure of his holding is a license such that no cautious investor would feel justified in expending a large sum of money to equip and maintain a plant which might have to be forfeited to the Government.

We are informed that the leaders of the forest reserve movement are not only opposed to the idea of allowing mill-site areas to be patented in forest reserves, but they feel that it was a mistake for the Federal Government to have ever adopted the policy of parting outright with its title to the mineral lands of the public domain. They are strongly in favor of a leasing system under which the paramount title would never be granted. Our Government started on the leasing system, following the precedent of England, and the result was so unsatisfactory that it led President Polk, in his message to the Congress in 1845, to say: "The present system of managing the mineral lands of the United States is believed to be radically defective. More than a million acres of the public lands, supposed to contain lead and other minerals, have been reserved from sale, and numerous leases upon them have been granted to individuals upon a stipulated rent. The system of granting leases has proved to be not only unprofitable to the Government, but unsatisfactory to the citizens who have gone upon the lands." Congress thereupon ordered lead-bearing lands in Illinois and Arkansas to be exposed to public sale, as were other public lands. Similar Congressional action was taken later with reference to mineral lands in Michigan. Any radical change in our mining system, whether theoretically an improvement on the existing laws or not, will do vast immediate harm in unsettling conditions and in retarding steady growth. It would have an equally disastrous effect on the mining industry as would a radical change in our monetary and banking laws upon the financial world.

We feel certain that the forest reserve officials have no desire to cripple the mining industry. They cannot fail to recognize that the exploitation of mines is endangered by elements of uncertainty, at best, and that the development of our mineral resources needs every encouragement the Government can extend. The forest reserve system is of tremendous importance to the nation. It has already accomplished great good. But danger lies in its very greatness and power. Abuses are likely to spring up without the intention or knowledge of those in control. In writing the foregoing, we feel that we have pointed out errors in the administration of the forest reserves that deserve criticism. Those in authority have announced their desire to remedy defects, and we believe that protests such as that from Montana will assist in bringing about a harmonious application of the mining and the forest reserve statutes.

Personal.

MARK L. REQUA is at Goldfield.

HOWARD D. SMITH has gone to Lake Tahoe.

W. H. STAVER has returned to Freeport, Illinois.

CLAUDE E. JAMISON, of Los Angeles, is visiting San Francisco.

HUBERT H. HALL is with the Yukon Gold Mining Co., at Dawson.

EDWIN J. COLLINS has returned to Tonopah, from San Francisco.

FRANK H. PROBERT has returned to Los Angeles from Patagonia, Arizona.

FRANK BAILIE is superintendent of the Columbia mine, at Sumpter, Oregon.

L. K. KENNEDY has returned to San Francisco from Greenwater, California.

ROBERT T. HILL of New York is in Nevada and will shortly visit San Francisco.

W. P. LASS is in charge of the Alaska-Juneau mine, in Silver Bow basin, Alaska.

J. MORGAN CLEMENTS is on his way to New York after an extended trip through the West.

ALFRED TILLY has left Barranquilla, Colombia, S. A., and will reside at Falmouth, England.

EDWARD C. WEATHERLY, who has been at Ouray, Colo., for the past year, has returned to London.

JOHN B. FARISH is at Guanacevi, Durango, Mexico, and will be in San Francisco about July 15.

GRANT E. DAVIS has left Rawhide, and will open an office as mining engineer at Manhattan, Nevada.

F. L. BOSQUI has returned to San Francisco from a visit to the Mónica mine, near Kirkland, Arizona.

E. J. N. OTT, formerly assayer for the Alaska-Treadwell Mining Co., is now at Nevada City, California.

W. L. COLE, of the Mountain Copper Co., has gone to British Columbia, and will later visit Butte, Montana.

ROY N. BISHOP succeeds AUSTIN H. BROWN as general manager of the Trinity Copper Co., of Kennett, California.

WILLIAM C. GREENE sailed from San Francisco on July 2 for Yokohama, from where he will go to St. Petersburg.

W. L. SAUNDERS, president of the INGERSOLL-RAND CO., has been in Denver attending the convention of the Civil Engineers.

BYRON E. JAMES, until recently in charge of the Mining Department, University of Idaho, leaves this week for Durango, Mexico.

FRANK ELMORE has recently been in Melbourne, Australia, after a visit to Broken Hill. He will return to London by way of Vancouver.

POPE YEATMAN has been re-appointed general manager for the Nevada Consolidated Copper Company and the Steptoe Valley Smelting Co., at Ely, Nevada.

R. R. HORNER, formerly with the Consolidated Gold Fields, Ltd., of South Africa, has opened an office as a mining engineer at 704 Peyton Bdg., Spokane, Washington.

JOHN G. KIRCHEN has been appointed manager of the Montgomery Shoshone Consolidated, at Goldfield. Mr. Kirchen is also acting as manager of the Tonopah Extension.

DIVIDENDS.

On July 3 the Bunker Hill & Sullivan Mining & Concentrating Co., paid dividend No. 130, of $75,000. This makes the amount of dividends paid since January 1, $480,000, and the total to date, $10,296,000.

GEO. L. HURST, of the RISDON IRON WORKS CO., has returned from Butte, Montana, and reports having received an order for a large dredge from the British Butte Mining Co., to operate on the ancient channel recently proved at Rocker, four miles west of Butte.

Latest Market Reports.

LOCAL METAL PRICES—July 2.

Antimony	12@16c	Quicksilver (flask)	$45@45.50
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.85@ 5.80c	Tin	31¾@33¼c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
June 26	12.63	4.49	4.47	54¼
" 27	12 63	4.48	4.47	53¾
" 28	Sunday.	No market.		
" 29	12.56	4.45	4.47	54
" 30	12.50	4.44	4.47	53⅝
July 1	12.50	4.44	4.47	53½
" 2	12.50	4.44	4.47	53¾

ANGLO-AMERICAN SHARES.

Cabled from London.

	June 25. £. s. d.	July 2. £. s. d.
Camp Bird	0 13 0	0 13 0
El Oro	1 5 7½	1 6 9
Esperanza	1 7 6	1 10 0
Dolores	1 5 0	1 10 0
Oroville Dredging	0 10 9	0 10 7½
Stratton's Independence	0 1 3	0 1 6
Tomboy	1 13 9	1 11 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. June 25.	July 2.
Amalgamated Copper	65⅞	66
American Smelting & Refining Co.	75½	76½
Boston Copper	11½	11
Butte Coalition	21¾	22½
Cumberland Ely	7½	7⅝
Dolores	6½	6¾
El Rayo	2	2 15/16
Giroux	3¼	3¼
Greene-Cananea	10	10¼
Indiana Sonora	4½	4¾
La Rose	5¼	5 3/16
Miami Copper	7	7¼
Nevada Consolidated	11½	11⅝
Newhouse	5⅝	5
Nipissing	7⅛	7
Ohio Copper	1⅞	2⅛
Tennessee Copper	36¼	36¼
Utah Copper	32⅛	33⅛
Yukon	3½	3 7/16

(By courtesy of Trippe & Co., 25 Broad St., New York.)

COPPER SHARES—BOSTON.

	Closing prices. July 2.		Closing prices. July 2.
Adventure	3⅞	Mass	4⅝
Ahmeek	70	Michigan	9
Allouez	28¾	Mohawk	57⅛
Amalgamated	65¾	Nevada Con	11⅝
Arcadian	3¼	North Butte	66
Atlantic	14½	Old Dominion	33½
Bingham Con	50	Osceola	100
Boston Con	11	Parrot	23
Butte Coalition	22¼	Quincy	85
Calumet & Arizona	109	Santa Fe	1¾
Calumet & Hecla	655	Shannon	13¼
Centennial	23	Superior & Pittsburg	11¾
Con. Mercur	40	Tamarack	58
Copper Range	71½	Trinity	13
Daly-West	10⅝	United Copper Con.	6½
Franklin	9¼	Utah Copper	33
Granby	99	Victoria	4½
Greene-Cananea, ctf	10¼	Winona	5½
Isle Royale	19¼	Wolverine	130

ENGINEERING SOCIETIES.

During the past week five of the national engineering societies held their annual conventions. The American Society of Mechanical Engineers and the Society for the Promotion of Engineering Education held a joint meeting at Detroit, Mich. The American Society for Testing Materials and the American Railway Master Mechanics' Association each held its annual meeting at Atlantic City, N. J. The American Society of Civil Engineers held its convention at Denver, and the American Institute of Electrical Engineers, their annual meeting at Atlantic City the first of this week.

General Mining News.

ARIZONA.

COCHISE COUNTY.

The No. 2 furnace of the Copper Queen is being overhauled and remodeled. The reverberatory furnace has been started and it is intended to keep it in commission from now on.

GILA COUNTY.

The Superior & Boston has recently started sinking a 1000-ft. three-compartment shaft on its property, 3 miles north of Globe. It is announced that heavy hoisting machinery and a compressor will soon be ordered, and that the railroad of the Arizona Commercial will be extended to the new shaft of the Superior & Boston.——It is reported that the Miami Copper Co., seven miles southwest of Globe, will install a concentrating plant some time this year. The Red Springs shaft is 700 ft. deep and a new level is to be started at the 670-ft. point.

SANTA CRUZ COUNTY.

It is reported that the United States Smelting & Refining Co. is considering the purchase of the Mansfield copper property, near Patagonia.——A boiler and hoist have recently been taken to the Red Cloud group of claims and will be used in sinking a new shaft.

YAVAPAI COUNTY.

A new double-compartment shaft is being sunk on the Emporia, seven miles south of Prescott. This mine was recently sold to a New York syndicate. A new hoisting plant will be installed and the shaft carried down to a depth of at least 400 ft. before any extensive lateral work is commenced.——The Mount Elliott Con. Mines Co., at Chaparral, shipped two cars of concentrate last month, and expect to maintain this same output in the future. The bullion shipments are also satisfactory. The company will resume sinking in the 400-ft. shaft during July, and will install a 10-drill compressor. It is rumored that the 10-stamp mill will be replaced by a modern 40-stamp plant some time next fall.

CALIFORNIA.

AMADOR COUNTY.

The Bay State mine, near Plymouth, has started a small force of men repairing the hoist, which was recently destroyed by fire. When the repairs are made the mine will again be worked.

CALAVERAS COUNTY.

A rich strike was made last week in the Cross shaft of the Utica. It is claimed that 17 sacks, worth more than $100,000, were taken out.——The Green Mountain, the Green Mountain Ex., and the Chili Gulch placer mines, all near Mokelumne Hill, have been sold to T. C. Huxley, of Oakland. A new company is being formed, which will build a dredge and also develop the two deep channels which pass through the property.

NEVADA COUNTY.

(Special Correspondence).—At the Central shaft sinking has been suspended and the shaft is being put in shape for the cutting of stations at the 5000 and 5400-ft. levels. An electric pump will be installed near the 5000-ft. level to keep the lower levels free of water. Good ore has been developed at several points in the new workings.——The Conlan mine has been inspected by five of the largest stockholders. They favor the re-incorporation of the company, in the belief that such a course would enable the owners to untangle the financial trouble and operate the mine.——The adit being driven at the Celina mine, to intercept the vein, is in 125 ft. Three shifts are working.——H. S. Abbot is examining the Ethel mine in the interests of Goldfield mining men. A few men are working at the property.——Several parties of lessees are working in the Champion and Home mines. Good ore is being mined at several points. All work has been suspended by the company.——Practically all the men working at the Brunswick mine have been laid off pending the settlement by the board of directors of the future working plan of the property. It is rumored that a new shaft will be sunk.——It is reported that Senator Nixon and George Wingfield, of Nevada, will shortly visit the Grass Valley district with a view to the purchase of mining properties.

Grass Valley, June 29.

PLACER COUNTY.

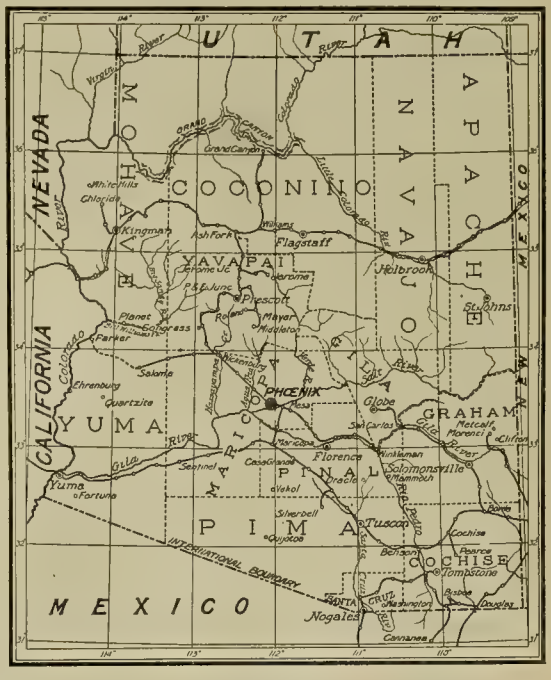
It is rumored that the Orpheum mine, near Auburn, will build a 10-stamp mill and work the property on a large scale.——The Blue Eyes, above the last Chance, has started up.——The Alpine mine, near Greenwood, is adding 10 stamps to its mill.

SHASTA COUNTY.

The Trinity Copper Co. has recently sold to the Bully Hill Smelting Co. about 700 tons of ore for use in the latter plant as a fluxing mixture. The ore was shipped from a storage bin of the Balaklala, which was filled before the close-down last October.

SIERRA COUNTY.

Morrell & Rea have taken a bond on a group of mines near Mountain House, including the Brush Creek and the



Map of Arizona.

Ante Up. The Brush Creek has produced large quantities of bullion in the past, but owing to internal friction among the owners it has not been worked recently. It is believed that the new owners will work the mine on a large scale. This is the second property Morrell & Rea have recently purchased in this district, the first being the Tom Boy, near Forrest.——The Poker Flat gravel mine has started a shaft on the property belonging to the company of the same name at Poker Flat. The shaft will be sunk to bedrock and the gravel mined from drifts and cross-cuts.

TUOLUMNE COUNTY.

The six-table slime plant erected by P. H. Craven of Spokane, Wash., at Shawmut, for the Eagle-Shawmut Mining Co., commenced operations last week.——The Lion Gold Mining Co. has been granted an additional month in which to resume operations under its bond on the Ida Klein mine, in Yorktown gulch.——The new Omega mill has been running since the latter part of last week. The plant has 10 stamps and is electrically operated throughout.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—A rich strike has been made on the Pilz property, in East Argentine. In extending the west drift on the Pilz vein a streak of heavy galena has been exposed that is from 10 to 20 in. wide. The ground has been opened for 15 ft. and the shoot has proved to be continuous. The ore assays 55% lead, from 60 to 75 oz. silver, and ½ oz. gold per ton.——A rich strike has just been made in the Scepter adit, Democrat Mtn. A body of ore has been uncovered that is 18 in. wide and assays from 170 to 225 oz. silver per ton, and 25% lead. A fair tonnage is now being broken, and within the next few days stoping will be started. The Scepter adit is an extension of the Sunburst, the adit now being advanced to cut under the Sunburst workings. When the objective is reached, a 380-ft. raise is to be made, after which all the ores on the west side of the mountain will find an outlet on the Georgetown side.——The old Everett mine, on Republican Mtn., is again undergoing development. Byers, Shatz & Co., operating under lease, are running a drift westerly on a 10-in. streak of ore that mills from 45 to 50 oz. silver per ton and from 30 to 40% lead. This mine was one of the early-day producers of this section, but owing to litigation it remained in idleness for over 30 years.——A force of men is being employed at the Mineral Chief mine, and shipments of both smelting and concentrating ore will be started in a few days. The aerial tramway has been completed and is now ready for the delivery of ore to the base of Democrat Mtn. ——Work has been resumed on the Faurot group of claims, on Saxon Mtn. The adit is now in nearly 300 ft. and a streak of ore is being followed that is from 2 to 5 in. wide.——A hydraulic washer has just been installed at the American Sisters mill, Columbian Mtn. Other improvements have been made at the 25-ton plant, such as the readjusting of the machinery, and now the mill is running day and night. During the past week 50 tons of lead concentrates were marketed, that brought a return of 350 oz. silver and 25% lead. The plant is being run on material from dump No. 1, a belt-conveyor having been installed for the hoisting of the ore.——Work has been resumed in driving the Raymond adit, Griffith Mtn. The bore is now in 875 ft. and another vein will be reached within the next few feet. Driving is in progress upon the vein, cut 825 ft. from the adit entrance, a body of $60 silver-lead ore being followed that is from 2 to 6 in. wide. Stoping will be started shortly.——Several pieces of machinery, including rolls, screens, and tables, arrived this week for the Crescent M. & L. Co. The equipment has been taken to the 10-ton mill below the dumps of the Mineral Chief mine, and as soon as it has been installed the plant will be run upon ores from the New Boston mine.——Work has been resumed at the Doric adit, after a temporary close-down of three weeks, due to a lack of fuel. A new company is being organized and operations are to be carried forward on an extensive scale.——Work was resumed last week upon the Buffalo property, in the gulch between Alpine and Griffith Mtn. A cross-cut has been started to intersect the Buffalo vein at increased depth under the old workings.——Work is again to be put under way at the Ramsdell property, Lincoln Mtn. The bond of $10,000 has been provided for, while a working capital has been subscribed. Driving will be started west on the Ramsdell vein, cut by the Market adit, and a raise is to be made to connect with the old shaft-workings. The milling plant will soon be completed, or as soon as the kind of machinery to be installed has been decided upon.

Georgetown, June 27.

GILPIN COUNTY.

A rich strike is reported from the Iowa Girl mine, in Moon gulch, near Rollinsville. The property is being developed by an adit which has been extended for a distance of about 200 ft., and in the face there is a large-sized stringer of concentrating ore through which are streaks of high-grade material. Pieces of the ore have been roasted and show evidence of tellurium. Assays as high as $300 per ton have been obtained.——It is reported that the Flint mine, near the Perigo, has found ore in its 100-ft. level which assays more than $65 per ton in gold, silver, and copper. Two shifts are at work, stoping, and driving a drift at the 200-ft. level to strike the same orebody.——The Siren G. M. & M. Co. is re-timbering its shaft at the head of Moon gulch. The company is to install a new gasoline hoisting plant and a shaft-house. L. C. Todd, Central City, is in charge.——The Smuggler shaft, in Moon gulch, has been unwatered during the past week, and a drift has been started at the 100-ft. level. Stoping is also in progress in the adit, and a raise is being made to secure better ventilation.——It is reported that new capital has become interested in the Eureka property of John G. Striffler, of Tolland, and that a new plant of machinery will be installed. ——The Rochester property, on Michigan hill in the Pine Creek district, is to be started at an early date. W. H. Barrick of Denver is interested.——Some alterations and improvements are being made at the new mill of the Square Deal M. & M. Co., near Gilpin, and the management expects to have the plant running at an early date. The mill uses the dry process and is especially designed to handle the ores of the Gettysburg group, in Lump gulch.

GUNNISON COUNTY.

The Camp Bird mine, at Bowerman, is sorting the shipping and milling ore, and last week shipped two cars of the former to Salida, and two are to follow this week. The mill is running steadily and will soon add 10 stamps to its present capacity.——The Augusta tram is operating and delivering the ore from the adit to the mill-site, nearly a mile distant and 1000 ft. lower. Encouraged by the success, surveys are now being made for an extension of four miles to the terminal of the railroad at Smith Anthracite.

LAKE COUNTY.

Arrangements are being made for extensive operations on the Crescentia shaft, on Rock hill. A controlling interest of the stock of the Rebate Mining Co., which owns the property, was sold during the week to Lou R. Johnston, of Denver, and associates, and it is announced that the new owners expect to enlarge the scope of their work.——A new boiler and engine have been put in at the Huckleberry shaft. When the property is unwatered the shipment of ore will be resumed.

SAN JUAN COUNTY.

The Anti-Periodic, on Galena Mtn., near Silverton, has resumed.——The small stamp-mill at Howardsville, erected by the Little Nations Co., has been pounding ore for the past week, and the management reports a good saving. The ore is carried from the mine, on King Solomon Mtn., to the mill by a mule pack-train.

TELLER COUNTY.

The Consolidated Copper Creek Co., operating on the Delmonico property, on Bull hill, will sink the shaft from the present level of 975 ft. down to the 1100-ft. point. A station will be cut at the 1000-ft. level. At that point, which corresponds to the 1000-ft. levels of both the Vindicator and Findley properties, an effort will be made to intersect the big shoots extending through both of these latter properties.——The Midget mine, near Cripple Creek, has resumed operations after a close-down of two weeks, during which necessary repairs have been made to the compressor.—— The Trilby mill, at Cripple Creek, is completed and will be put in commission early in July. The higher-grade ore is being shipped at the rate of about 600 tons per month.—— The Maid of Erin, on the southwestern slope of Raven hill, made its first shipment in some time, last week. The ore came from the new strike on the 400-ft. level, where Stark & Agnew are leasing.——A steam-hoist has been put in at the Baker & Co. lease on the Mountain Goat claim of the Comanche Plume Gold Mining Co., and the lessees began hoisting ore last week.——A depth of 200 ft. has been attained in the new vertical shaft on the Ophir mine on Raven hill, and a cross-cut has been started to the main Ophir vein.——The Roanoke, on the west slope of Mineral hill, is again producing, after laying idle since 1904.——

The Western Investment Co., which has recently secured a lease on the main workings of the Mary McKinney, will start active operations on the property early in July. The McKinney Co. is engaged in cleaning up the stopes, and as soon as this is done the leasing company will take possession.——W. L. Jameson, of Denver, has leased the group of claims belonging to the Meteor Leasing Co., consisting of the New Moon, the Chance, and the Little Annie Rooney claims, for a period of four years.

IDAHO.

IDAHO COUNTY.

Five feet of gold and copper ore, averaging $20 per ton, has been struck in the Black Pine property, at Orogrande, owned by J. H. Colgrove. The strike was made in an adit started two years ago, which cut the vein at a depth of about 65 ft. The property has not been worked for several months, and the owner was doing assessment work when the vein was struck. He is now planning to do extensive development work.

OWYHEE COUNTY.

The Wennersten Mining Co., Ltd., has been organized to work the mining property of the defunct Little Rose Co., on the west side of Florida Mtn., near Silver City. The company expects to sell most of its stock in London.

SHOSHONE COUNTY.

(Special Correspondence).—One of the most important as well as the richest strikes ever known in the history of the county was made last week on the property of the Anchor Mining Co., at Burke. This strike was made at the bottom of a 35-ft. shaft, where one foot of carbonate ore and two feet of lead crystals were encountered. The carbonate ore assays about 1250 oz. silver per ton. The crystallized lead assays from 85 to 90% lead. The strike was made on the Diamond Hitch claim, between the Hecla and Mammoth mines.——All the legal difficulties which have attended the development of the Rex mine are about to be settled, and the company's indebtedness of $10,000 is to be cleared off. Under the Francis lease, which was to terminate in 1909, the mine made more or less regular shipments to the smelter, and it is understood that several new and valuable orebodies were opened up during the development. A new syndicate has been formed to handle the affairs of the company, and it is probable that a resumption of work will take place in the near future.——A crew of miners has left for the Monitor mine, near Saltese, Mont. These men are engaged by the Success Co., which has taken a bond on the property. It is the intention to commence development work as soon as the preliminary preparations have been completed. The machinery at the mine will be re-modeled and a concrete foundation will be placed for the present hoist and engine.——Shipments from the Morning mine, at Mullan, have commenced again, after a shut-down of several months. A full force of men has been put to work at the property, which is one of the biggest producers of the district.——P. F. Smith, of Wallace, has been appointed receiver for the affairs of the Amador mine, following the action commenced in the District Court here by Mrs. MacKinnon for the recovery of $25,000. The appointment was made by Judge E. E. Steele of Moscow. The receiver's bond has been fixed at $5000, but up to the present time no action has been decided upon with regard to the affairs of the company.——The annual meeting of the stockholders of the Leslie Mining Co. was held this week at Wallace.——Arrangements were made to drive an adit from the railroad track to tap the Leslie ore at 700-ft. greater depth than the present lower workings, and under the large and well-defined orebody exposed in the present working adit. The new work will be started in from 60 to 90 days, and it has been officially announced that it will cost the stockholders neither cash nor stock, although the arrangements have all been completed. This tunnel will be over 5000 ft. in length, and will give a total depth of about 1650 ft. It is intended to install some machinery at the spot where the adit will be started. This will consist of a 10-drill compressor, a drill-sharpener, besides a new boarding and bunk-house and saw-mill.——Miners and equipment have been sent out to the Bullion property, near Saltese, to get the machinery in shape for sinking. The completion of the raise which connects with the bottom of the shaft allows a continuation of the sinking on the vein. Including the raise, the shaft is now down 130 ft., and another 100 ft. of sinking will commence at once, when cross-cutting will begin.

Wallace, June 29.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—One of the largest sales of ore made in recent years was made at Galena this week by Lynch & Williams, operating on the Lou Dillon lease. The ore was purchased by the St. Louis S. & R. Co., and consisted of 700,000 lb. of lead ore, estimated at $22,925. The company has been holding the ore since last year, and was offered $38.50 a thousand for it at one time, but refused the offer, thinking the lead prices would go still higher.——The Galena lead smelter has resumed operations after a shut-down of several weeks. The smelter could not obtain lead enough to operate and was forced to close. The amount on hand, together with the current purchases, will insure steady operation for some time. About 40 additional men were employed when the operations were resumed.——Frank Hunt and associates have begun the development of the Murphy land, west of Empire City. This tract has never been actively mined, though drilling was done upon it and sheet-ore found. The present company will drill to verify the old records, which state that sheet-ore was found at 250 ft. The development will mean much to this part of the camp, as the finding of sheet-ore would prove a valuable addition to the field already developed in the western portion of the district.——The concentrating plant being erected by the Big Chief Co., at Baxter Springs, is nearing completion. The old Sloan mill was purchased and moved to the lease, where it has been remodeled and will now handle 200 tons of dirt per shift. Only a few mines in the Baxter Springs camp have continued to work steadily since the low ore prices. One of these, the M., K. & T. plant, has just closed down indefinitely on account of the death of one of the members of the company. This mill was one of the best producers in the camp, and will mean a great loss to the weekly turn-in for that field.

Galena, June 26.

MICHIGAN.

A small double hoist used for some time last summer at the Empire shaft has been moved to the new No. 2 shaft of the Keweenaw Copper Co.'s Medora mine.——During the past week connection has again been established between the old Cliff mine and the South Cliff through the third level of the latter property. It has been over 50 years since the South Cliff was worked, and about 30 years since active mining work was stopped at the Cliff, known in its early days as the Pittsburg & Boston. Some intermittent tribute work has been carried on since that time, however.——The two shafts which the Ahmeek Mining Co. started last week will present some unique and novel engineering features. Both shafts will be sunk simultaneously, going down at an angle of 80° in the form of an inverted V. In this manner it will be possible to use a single rock and shaft house for both openings, a saving in the first cost as well as the number of men necessary at the shaft, one crew being able to do the work of both shafts on the surface. The shafts will take the dip of 80° until they strike the lode, when they will follow the dip of the mineralized formation. This plan of mining is similar to that begun some time ago at the Allouez, and where it is being found entirely practical.——Tamarack plans to increase the size of the pumping plant on the shore of Lake Superior. The building will be 60 by 80 feet.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—During the past week a number of mills in the district were closed, especially in the Webb City sheet-ground camp, where most of the ore pro-

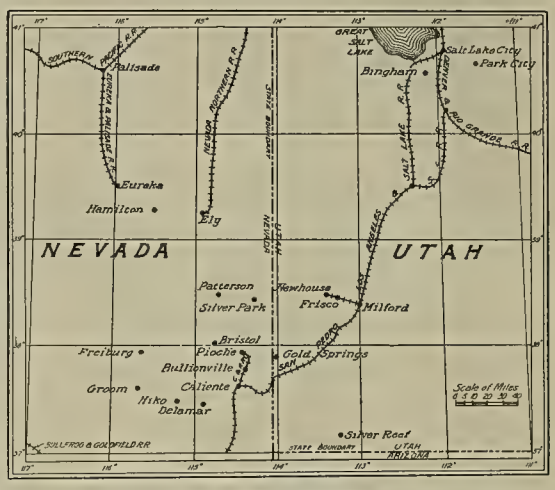
duced is zinc-blende. The shut-down was caused by the low zinc prices, operators being unable to run the strictly zinc-producing mines at a profit. It is rumored throughout the district that an organized shut-down will be effected by the zinc producers by the first of July unless the price of zinc rises. Four of the large plants north of Webb City closed down last week, and these, together with the two plants burned, will materially affect the output of the camp. Almost all the mines in the district have been operated at increased expense this spring on account of the high water and the necessity of installing heavier pumping machinery. This fact, with the low price of zinc, has obliged many of the mines to shut down until conditions are more favorable. The lead producers will continue to operate, as the high price of lead is very satisfactory.——Unusual activity has been noted in the Duenweg camp the past few weeks. Some rich strikes have been made. On the Walker land, northeast of the town, three companies are working, and all are in good ore. The Sayers Mining Co. has sunk 11 drill-holes on its 20-acre lease, and 10 of these penetrated a rich deposit of lead and zinc-blende at 130 to 150 ft. The ore is disseminated but also occurs in chunks, some of these weighing as much as 25 lb. On the same land the Pencil-Franks Mining Co. has developed sheet-groud at 150 ft. in two shafts. Development has proceeded far enough to demand a mill for the treatment of the ore.——On another portion of this tract Wilson & Winters hold a lease and have sunk a shaft into sheet-ore at 140 to 150 ft. Both galena and zinc-blende are found, the galena in the upper levels and the blende below in the sheet formation.——On the Hall land, south of Duenweg, a new silicate camp of wide extent has been opened up. About 1,150,000 lb. of this ore has been removed from one shaft since February. The ore is found at the 95-ft. level and shows a 10-ft. face. A drill campaign has been begun to determine the extent of the deposit.——The Greenhorn Mining Co., across the road from the silicate workings, is developing a sheet-ore deposit at the 140-ft. level. The company had a mill completed and one turn-in had been made when the plant burned down. A second plant is to be erected at once.——Two mills are in course of erection north of Webb City. One is upon the Bird Dog lease, and is a plant of 250 tons capacity, and the second is being built at shaft No. 2 of the Goode mine, and is of 150 tons capacity. Two shafts upon this lease have been connected by air-drifts.——The Endeavor Mining Co. is erecting a 225-ton concentrating plant upon the 40-acre lease, between Carterville and Prosperity. The lease had just been developed to a productive stage when the mill burned down. The second plant is almost ready for operation. The company is working upon a 12-ft. face of very rich zinc-blende and galena, the dirt running as high as 2 to 3% galena and 4 to 5% blende.——The Continental Mining Co., at Johnstown, has started the mill after a long shut-down and a continued pumping campaign. The mill has been remodeled and a new storage-bin and crushing-room have been added. The capacity of the mill has been increased with these improvements, and the plant can operate more steadily. The skip system of hoisting is employed at this mine.——A new shaft is being sunk on the old Eclipse land, south of Carterville, and is now down 65 ft. Not a drill-hole has ever been put down on the 12 lots of the Eclipse lease, though the tract lies in the midst of a thoroughly tested and developed territory. The American L. & Z. Co. adjoins the tract on the east, upon which a good deposit of sheet-ore was discovered last year. The lots are practically virgin territory, and will be thoroughly prospected.——A unique deposit of zinc-blende is found in the north Webb City camp. It is a soft-ground orebody on the Integrity lease, the ore being found at 100 ft. This is the only workable soft ground found in this camp during the past year. The mines surrounding this lease are all of the sheet-ground variety, and the deposit is found in hard ground at 180 to 250 ft. The 100-ton mill is kept busy and only two machine-drills are required to break the ground. This is one of the few zinc mines that has operated with profit during the recent low price of ore.——Water in the Spring City camp, south of Joplin, has been very troublesome, but in spite of this fact the Sunrise mine has been operating successfully. The 20-acre lease is now fully developed and is producing. Two shafts are being worked by the company, while a third is being sunk by a sub-lessee. The ore was found at the 140-ft. level and shows a rich deposit of zinc-blende and galena. The ore is being milled by a crusher, rolls, and hand-jigs. The ground now has reached the developed stage where a mill is a necessity. A three-inch pump handles the water successfully, though the Argosy and several other properties in the vicinity have experienced considerable trouble with water.——The Delta Mining Co. has again resumed operations, after being closed down in order that a concrete bottom might be put in the mill-pond to prevent leakage into the drifts. The work is now completed and operations have been started upon a large dump-pile containing a large amount of crushed rock and ore obtained during the underground development.

Joplin, June 29.

NEVADA.

ESMERALDA COUNTY.

Work has been begun on the Black Bird Mining Co.'s property in the Red Mountain section of the Goldfield district. The property lies between the Butte Boys and the Diamondfield Red Mountain. At a depth of 300 ft. a quartz vein was encountered a few months ago.——The Chicago Exploration Co. has recently acquired control of the Lucky



Map of Eastern Nevada.

Boy and the Mountain King mines, near Hawthorne, and shipments of high-grade ore from the mines have been resumed.——The first shipment of ore from the Frances Lime Point mine, in the Hornsilver district, has arrived at Goldfield, for the Nevada Goldfield Reduction Works.——The mines of the Goldfield district produced, during the week ending June 26, 2060½ tons, of an estimated value of $148,315. The Tonopah mines produced during the same period 5780 tons, having an estimated value of $147,650.

HUMBOLDT COUNTY.

The Potter & Arnet lease, on the Mazuma ground, is installing a new pump and hoist, and expects to sink to considerable depth before cross-cutting.——G. H. Haynes has started the new 40-hp. hoist at his lease on the Mazuma Hill and will sink a 300-ft. shaft.

NYE COUNTY.

The Tonopah-Liberty mine, 25 miles north of Tonopah, is enlarging the mill on its property to twice its present size and installing a 100-ton Huntington mill.——The Tonopah Mining Co. of Nevada has declared a quarterly dividend of 25c. per share, payable July 21. The company suspended dividends a year ago, up to which time they had been paid regularly.——Ground has been broken at the Solid Gold lease, on Round Mtn., for a new mill of 50 tons daily crushing capacity. This will be the fifth mill in the district.——The Gold Bar, at Rhyolite, may build a mill some time next

fall. J. P. Loftus, president of the company, was at the property last week, and is authority for the statement that if the Homestake mill proves a success, the Gold Bar will probably build a similar plant.——The Tecopa Con., near Bullfrog, is said to be planning a 500-ton concentrating plant and the installation of a new compressor. John T. Overburg, of Bullfrog, is interested.

ORMSBY COUNTY.

The Western Smelters Corporation has been incorporated to build a smelter on the Carson river, 5½ miles above Carson City, near the old Brunswick mine. The company has an office in Reno. The site of the proposed plant is 40 acres of land between the Carson river and the Virginia & Truckee railroad, and has a water-power of 150 hp. now available, which it is claimed can be increased to 350 if desired. The first unit to be erected will have a capacity of 250 tons, with one furnace for copper ores and one for lead, gold, and silver ores. If constructed the plant will be run as a custom smelter.

WHITE PINE COUNTY.

The Stuart Holding Co. received last week two carloads of machinery for its custom mill at Cherry Creek.——The Boston Nevada Mining Co. will increase the force of men at work on its Cumberland claim in the Osceola district.——The Boston Nevada Co., which owns 160 acres of placer ground at Hogum, in the Osceola district, will let a contract for a shaft to prospect some of the rich placer deposits such as have been found in the zone near the mouth of Mary Ann canyon.——The second unit of the concentrator at the Steptoe Reduction Works will be put in commission by the middle of July.——The French American Mining Co. has purchased the Macon City group of claims at Lane City, the consideration being $75,000. The new owners will start shipments at once. The same company has recently increased the working force at its properties in the Osceola district and at its Duzette group, near Lane City.——P. M. Baker has purchased 80 acres of land in the Osceola district, which includes the water rights to Baker and Lehman creeks.

NEW MEXICO.

The Anderson Apache Copper Co., five miles south of Hachita, will soon commence shipments of ore to the Copper Queen smelter, at Douglas. During the past year a two-compartment shaft has been sunk and 1000 ft. of cross-cuts and drifts have been driven.——A rich strike of gold-silver ore is reported from the hills north of Encino.——The Oil Exploration Co. has resumed drilling at its oil-well near Santa Rosa. It is now 1100 ft. deep, and the company plans to go 3000 ft. if necessary.

OREGON.

The Ohio mine, near the Columbia, at Sumpter, will soon be opened, and the mill will be equipped with new machinery. John Thomson, president of the Columbia Ex. Gold Mines Co., is interested.——The Takilma smelter, which has been idle for the last nine months, was started last week. The company will do its own teaming this season.——The Quebec mine, in the Sumpter district, in which large bodies of gold ore were opened several years ago, but which has been closed down because of internal dissentions among the stockholders, is to be operated again at an early date. The mine was the scene of great activity five years ago.

UTAH.

BEAVER COUNTY.

(Special Correspondence).—There is an improvement in mining conditions reported from Beaver county, where recently a number of mines that had been idle for months past have been started up again. In the early part of the year the Cactus mine, of the Newhouse Mines & Smelters Corporation, was practically the only producing property in the several districts of the county. Since then the Horn Silver mine has contracted its output to the Tintic Smelting Co. and is ready to ship. The Hecla, Cedar, and Burning Moscow are also shipping again. W. D. Elwell, of Boston, president of the Majestic Mines Co., who recently formed a re-organization scheme for the Majestic Copper Co., has been on the scene, has paid off the debts of the older corporation, and ordered development work started again. The Majestic mines produced a large tonnage of low-grade copper ore during the high metal market times of last year, and were among the first in the State to close after the slump came. The Indian Queen Mining Co., which recently installed heavy power equipment, is conducting a vigorous development campaign under encouraging conditions.

Beaver, June 30.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The lessees of the Republic mine have shipped a carload of ore for a test of value and are now engaged in heavy timbering, preparatory to new development on the upper levels.——A few men are engaged in stoping ore above the bottom level of the Lone Pine workings of the Pearl group, under the direction of the Syndicated Deep Mines management.——It is probable that the gasoline engine at the Copper Key mine, on Belcher Mtn., will be replaced by steam, owing to the abundance of timber on the property and the necessity for more power. The mine is now idle, awaiting developments.——It is learned that the report of $60,000 having been paid for the Manila mine, in Keller district, is untrue, but instead parties interested in the Keller smelter have paid $500 cash on a $60,000 bond for the purchase of the mine. Twenty men are employed in building a new wagon-road between the Manila mine and the smelter. A force will be employed to break ore in the mine, which will be hauled on wagons, pending the construction of a tramway.——An immense tonnage of gold and copper bearing quartz ore developed over a year ago in the Lone Star & Washington mine, close to the international boundary, has recently been reported as a new strike. Work on the property was suspended for the time being, during the late financial trouble in the East, but has been resumed. The British Columbia Copper Co., now owning the property, is about to start a new adit across the claims from Goosmoos creek, about 4½ miles distant from the Spokane & British Columbia railway.——A new strike of gold-copper ore has been made in an iron sulphide vein on the Lake group, about six miles south of Orient. The property will be developed with Montana capital.

Republic, June 23.

OKANOGAN COUNTY.

The Nighthawk Mining Co., at Loomis, is putting in a 10-stamp mill at its mine, and expects to have the plant running before fall. The adit is being driven with power-drills.

CANADA.

BRITISH COLUMBIA.

The Indian Chief group of claims, on Sidney inlet, west coast of Vancouver island, recently held by ex-Governor Dewdney, have been sold to the Vancouver Island Copper Co., Ltd. Seventy-five per cent of the stock of this new company has been acquired by the Alaska & Northwest Copper Co., Ltd., of Seattle, and the other 25% is allotted to Mr. Dewdney. The cost to the Alaska Copper Co. of their share is in the neighborhood of $140,000. The new company announces that it will start work at once. The ore will probably be shipped to the Tyee smelter, at Ladysmith, although it may be sent to Tacoma.——The Tyee Copper Co. has acquired the Grafter copper mine, one of the best propositions in the rich district adjacent to White Horse. The terms of the transfer are on the lease system, the Tyee company taking over the property for a period of 99 years, the latter to operate it and pay the owners a percentage on every ton of ore mined and shipped. The terms obtained by the owners are such as will bring to them a continual revenue, while the lessees, with their own smelter, can handle the ore after paying the mine owners with profit to themselves. A force of men has already started work, and shipments will begin as soon as the railroad spur to the mine is completed.——A rich strike is reported in the Mollie Gibson group, Burnt Basin district. It consists of a 7-ft. shoot of gold ore that will average $90 per ton. A wagon-road is being constructed to convey the ore 4½ miles to the railway.

Special Correspondence.

LONDON.

Formation of an Institute of Metals.—Great Cobar Report.

While American mining engineers and metallurgists are forming a new society which will aim rather at professional status than at the collection and dissemination of information, English metallurgists are establishing an 'Institute of Metals,' with a purpose in the opposite direction. This new institute has been started through the energy of two Manchester men, W. H. Johnson, a large consumer of copper alloys, and C. H. Carpenter, professor of metallurgy at Manchester University. The lines on which it is proposed to work are analogous to those of the Iron & Steel Institute. It will discuss the metallurgy of the non-ferrous metals, especially copper and its alloys, lead, zinc, tin, and aluminum, the word metallurgy including the whole range of metal-working, and not being confined to the production of a refined bar. The membership is to be open to all those who are connected with the metal industry, and the method of election will be similar to that of the Iron & Steel Institute, the Society of Chemical Industry, and the American Institute of Mining Engineers. To some extent the scope will overlap that of the Institution of Mining & Metallurgy, but this can hardly be helped. The Institution is primarily a professional body, and deals with metallurgy from a mining engineer's point of view. On the other hand, the new Institute will include a great number of members who would not be eligible for election to the Institution, but, for all that, are seriously interested in metallurgical operations. It is a remarkable fact that hitherto there has not been any society or publication in Great Britain making a specialty of non-ferrous metallurgy. To be quite candid, this is the reason why the *Engineering and Mining Journal* and the *Mineral Industry* obtained such a hold in England and the continent of Europe. These publications gave scientific and trade information that was not obtainable in any English publication. Other American papers, such as the *Brass World*, and the *Electro-Chemical & Metallurgical Industry* also enjoy a vogue. The Faraday Society deals to some extent with electro-metallurgy, but it is too scientific and does not concern itself with practical details. At one time the Society of Chemical Industry devoted a fair share of attention to metallurgy, but of recent years the great expansion of organic chemistry has tended to force the chemistry of metals into a corner. The new Institute starts out with a thoroughly representative council. Sir William White, late chief constructor to the Navy, is president. Professors Gowland and Turner represent science. Smelters are represented by the Hon. Odo Vivian, of Vivian & Son; J. Corfield, of Dillwyn & Co., the zinc distillers; J. D. Bonnor, of the British Aluminum Co.; Cecil H. Wilson, of the Sheffield Smelting Co.; Leonard Sumner, of the Broughton Copper Co.; Norman Cookson, of Cookson & Co., and Mr. Harvey, of Williams, Harvey & Co., the tin smelters, of Hayle; while the users of metals, the engineers, ship-builders, cable-makers, and others are equally well represented. I feel sure that the Institute will be a success.

The first annual report of the Great Cobar, Ltd., in New South Wales, has just been issued. It covers the period from the formation of the company, in May, 1906, to December 31, 1907. This well known copper-producer has yielded fortunes in the past to its Australian owners. On many occasions have London promoters tried to purchase it and re-float it over here. What prevented the success of these schemes was the enormous sum in cash required by the owners. In the successful flotation of two years ago the purchase price was £1,006,000, payable as to £800,000 in cash and the remainder in shares and debentures. The capital of the company is £1,300,000, consisting of £750,000 in shares and £550,000 in debentures. A good deal of money had to be spent in providing additional mining and metallurgical plant. The mine had got too deep and the orebodies too lean for the old methods to be possible any longer. With the working capital subscribed at the flotation, and also by means of loans amounting to £127,000, considerable improvements have been made, and at the present time the outfit is equal to anything in existence. Great delay in erecting the new plant was caused by the refusal of an American firm to accept the contract made by its English agent. It would be unkind to mention the name of the firm, but I will interpolate the remark that American manufacturers, to succeed in their export trade, must trust their foreign agents. In this case the firm lost the contract, and the whole work of estimating costs had to be done over again. In the end, only the new blast-furnaces and converters were bought in the United States, the steel buildings, engines, boilers, and electric plant being obtained in Great Britain. Another source of delay was the poor condition in which the mine was left by the vendors. The negotiations for the sale and the completion of details in connection with it occupied a good deal of time, and the vendors took the opportunity of extracting the best ore in the meantime, without properly attending to the condition of

Eastern Australia.

the mine. Up to the present time the smelting operations have been conducted at the old works, and the results are not as good as they will be before long. From the time when the company entered into possession, August 22, 1906, to December 31, 1907, the amount of ore smelted was 236,405 tons. In addition to this, 41,146 tons of first matte, slag, and flue-dust were passed through the furnace. The total matte produced was 15,953 tons, which was shipped to the company's works at Lithgow for treatment in the reverberatories and electrolytic refining plant. The reverberatories also treated purchased ore, slag, and flue-dust, and it is not quite clear from the report what was the actual yield from the company's own ore. The product obtained from the electrolytic plant during the period named was 6114¾ tons fine copper, 17,166 oz. fine gold, and 104,292 oz. fine silver. The proceeds were £593,902, and other receipts brought the total earnings to £603,655. The working costs were £353,048, and London expenses £12,176, leaving a profit of £238,431. Out of this, £49,500 went as interest on debentures, £112,500 as dividend on the shares, at the rate of 15%. It is interesting to note that the company has adopted a means of providing for the depreciation of the mine by arranging that £100,000 shall be set aside out of

each year's profits, beginning with 1908, for the purpose of redeeming the debentures. The estimate of the ore-reserves is handled in a very safe way by J. D. Kendall, the company's consulting engineer. In the Cobar mine there are blocked about 1,500,000 tons of similar tenor to the ore already treated, and in addition there are very large masses of ore of undoubted value. At the Chesney mine the ore blocked out is given as just under half a million tons, and here again the existence of further large supplies is known for a certainty. The report does not enter into very great detail as to the contents of the ore, which is a pity, because there has been a good deal of gossip in the stock markets to the effect that at the lower levels the copper content is low. In fact, the average content may be taken as being less than 3% copper and 1½ dwt. gold, and at the lower levels, not much more than 2%. In early days the grade was much higher, and the European smelters made fortunes by not telling the owners that there was any precious metal in the ore. The new smelting plant consists of three blast-furnaces capable of dealing with 1500 to 1800 tons in the aggregate every day, together with bessemer converters. There is also every possible provision for the cheapening of the handling and for the more complete recovery of the metallic content. With this fine up-to-date plant the company should be able to make satisfactory profits, even though the grade of the ore falls off. Anyhow the future earnings of the company will form an interesting study in the economics of mining and metallurgy.

KALGOORLIE, WESTERN AUSTRALIA.

Koolyonobbin Goldfield.—Horse-shoe and Great Boulder Developments. — Associated and Lake View Consols.—Dust Removal in Dry-Milling.—Water-Delivery.

The gradual decline in the gold output of this State, and the failure of well-organized exploring and prospecting parties to locate new fields, so that new mines could keep up the returns of those which are being reduced, has of late made the future of the mining industry look rather blue. It is with peculiar pleasure, therefore, that we are now able to report the opening up of a new field in the Koolyonobbin Ranges, 35 miles northeast from Southern Cross, in the Yilgarn goldfield. This goldfield has an area of 15,593 square miles, and since 1889, gold to the value of $8,440,000 has been produced; the annual yield at present being about $500,000. Most of this is produced from mines near Southern Cross.

It appears that prospecting has been going on in the Koolyonobbin Ranges for some time past, but only toward the end of April were any leases applied for. The new field appears to be approximately 10 by 6 miles in area, and consists of schists, ironstone, and conglomerate, full of quartz veins and outcrops. It is not one for a great rush of 'dryblowers' and the like, but from all accounts will be a field for a lot of careful work in development, and probably one for small companies with moderate sized batteries. However, in the course of a few months we will be more able to judge the place. Everyone who has visited it is rather optimistic, but moderately so.

The cross-cut at 2000 ft. in the Horseshoe went through a lode 5 ft. wide, worth $13 per ton. Driving at 2200 ft. in the Great Boulder still reveals fine ore. The Associated announces ore reserves as 430,414 tons at $10.30 per ton; and the Lake View Consols 172,839 tons, worth $6.70 per ton. The former mine is about to install an Edwards duplex roaster, and the tonnage will be brought up to 12,000 monthly. This company already has 18 Mertons and one Associated furnace at work. The Great Boulder is also building an Edwards duplex, making two of this type, together with 12 Edwards tilting-type and eight Mertons with extended finishing hearth, now running. Fourteen thousand tons of ore are treated monthly, but a mine like the Boulder is capable of more than that. On an average 12,000 tons of old slime are re-treated per month, either by the Ridgway machines or the filter-press plant. Many interesting comparisons should be obtained in this mill, as there are Krupp ball-mills working along with Griffin mills; Edwards tilting, Edwards duplex, and Merton roasters, and the Ridgway suction machines, with filter-presses of the hand-screwed and hydraulic types. Attached to the Krupp and Griffin mills in the several dry-crushing plants on this field, are fairly powerful fans for drawing off the dust that would otherwise float about, making work very unhealthy, and occasioning losses. The fans blow the dust into long narrow houses with Hessian walls and ends. When a sufficient quantity accumulates it is treated along with the ordinary ore in most cases. The Kalgurli treats its dust by agitating with bromo-cyanide. The Associated Co. is now experimenting by blowing the dust onto the second hearth of each Merton furnace, where part will be roasted and part go into the main flue, thus saving trouble with the unhealthy dust houses. Dust caught in the flues from the furnaces must be passed through again. On first thought one would think that the cold draught from the fan would cool the roaster, or that the dust would put the roast off. This proves not to be so, and the process appears to be a success. There has been some talk of erecting Cassel plants to treat the huge dumps of residue on the Oroya-Brownhill and Ivanhoe mines. These consist of sand, pan and tube-mill slime, and roasted concentrate residue. The Cassel plant on the Lake View Consols was designed to heat 100 tons daily, but so well has it worked that in 24 days 4070 tons were treated, yielding gold valued at $5700. If this is a sample of the residue dump, it will be pleasant to treat several hundred thousand tons of similar stuff.

Associated Northern, Kalgoorlie.

The output for April is shown in the following table:

Name.	Tonnage.	Yield.	Profit.	Dividend.
Associated G. M.	10,375	$108,000	$ 40,000	.....
Associated Northern ..	3,619	44,000	25,000	.....
Great Boulder	13,531	225,000	125,000	.....
Gt. Bldr. Perseverance	16,029	120,000	26,000	.....
Great Fingall	21,281	175,000	67,000	.....
Golden Horseshoe	22,980	255,000	100,000	$450,000
Hainault G. M.	6,050	35,000	3,500	.....
Ivanhoe	19,034	210,000	105,000	.....
Kalgurli G. M.	10,710	145,000	77,000	.....
South Kalgurli	9,030	61,000	10,000	.....
Lake View Consols...	9,513	60,000	6,000	.....
Lancefield	6,577	48,500	*3,500	.....
Oroya-Brownhill	11,681	80,000	21,000	55,000
Oroya-Black Range ...	4,140	51,000	17,000	.....
Sons of Gwalia	12,528	100,000	28,000	.....
Sons of Gwalia South.	1,902	24,000	10,000	.....

*Loss.

Total dividends to April 30, 1908, paid by all mines in West Australia amount to $88,735,000.

Rain was badly needed at some of the outlying centres in January, but since then we have had about five inches, and all dams are overflowing. Some 220 acres of crops are in at Coolgardie, and the owners will do well, as the soil

is rich. The amount of water used by the Kalgoorlie group of mines in March totaled 28,309,000 gal., supplied by the Government water-scheme. Our weather is very wintry, the mercury dropping to 38°F. recently, making a severe change from the hot weather of January, when the temperature reached 114 degrees.

MEXICO.

Railroad Employees Threaten Trouble. — Bread-riot at Saltillo. — Unrest at Casas Grandes and Ocampo. — Bismuth Mine near Culiacan.—Developments at Choix.

It would seem from recent events that a spirit of unrest pervades the Mexican Republic. Whether it will lead to trouble or not is difficult to say. During the past week the railroad employees have again been discussing the advisability of requesting or demanding that all foreigners be dropped out of the railroad service and their places filled by Mexicans. It is said that Messrs. Felton and Brown, seriousness of the disturbance cannot be obtained at this writing, but from the most conservative information available now, it would appear that the disturbance was much in the nature of a bread-riot. A large number of the unemployed, who are beginning to get hungry, had evidently banded themselves together to hold up the Mexican Central pay-car on its return from Saltillo, but the pay-master got word of it and ran around them. In this connection, it can frequently be heard in Chihuahua that unless the Greene Gold-Silver Mining Co. distributes a good sum of money among its laborers in the near future, there will be trouble in the Ocampo district, in the western part of this State. In news from Saltillo and Torreón the alarmists claim to see the hand of one of Mexico's former ministers of war, who, rumor has it, is only biding his chance. This suspicion would, of course, come to the mind of anyone acquainted with recent Mexican history.

Within the last week the Mexican press has been giving considerable space to the opening by Messrs. McQuatters and Sheppard, contractors in Chihuahua, of what they call

Map of Mexico.

presidents of the Mexican Central and of the Mexican National railroads, respectively, have replied that the employees will be chosen in accordance with their fitness, without regard to nationality. There was also a slight disturbance at Casas Grandes, in the western part of Chihuahua, a few days ago, where report has it that a small band, headed by Santa Ana Pérez, a former revolutionist, was attempting to stir up insurrection, but some twenty or more arrests had been made, and nothing more has been heard from that district. Finally, word has come from Saltillo, capital of the State of Coahuila, that some 300 to 500 men had risen, and overcome the police force of the city, had helped themselves to guns and ammunition, and started for Torreón with intent to kill Governor Cárdenas, gather recruits, and start a revolution. Two immediate results of this disturbance have been, first, a change in the routing of the Mexican Central pay-car, so that it will go from Saltillo to Monterrey and thence across to Torreón, instead of directly from Saltillo to Torreón over the Coahuila & Pacific railroad, as at first intended; and, second, the serving of notice from the Wells-Fargo Express Co. that no money would be accepted for consignment to or through Torreón. Absolute verification of the above and correct information as to the

the Bismuth King, located near Culiacán, in the State of Sinaloa, where ore running from 13 to 26% bismuth is reported to have been opened up. The property is heralded as the only producing bismuth mine on the North American continent. A chemical company at St. Louis is reported to have contracted for the entire output of the mine. The above is rather amusing, and attracted my attention for two reasons: First, in a recent issue of the MINING AND SCIENTIFIC PRESS appeared the statement that "a deposit of bismuth ore of sufficient size to make its mining on a large scale worth while, would yield sufficient of the metal to reduce the market price to much less than it has been in recent years; but it is possible that if the market were not artificially contracted, and the metal were mined and smelted without restriction, new uses would be found for it, and manufacturing on a larger scale might become a commercial success." Second: the Ballard mine at Leadville, Colo., has been a good producer of bismuth for the last ten years or more. It is to be hoped that the Bismuth King, in Sinaloa, is as good as reported, and that Bismuth Queen, which is being opened up by the same people, may prove a worthy partner. The Choix Consolidated Mining Co., a Los Angeles concern, is operating at Choix, Sinaloa, under the

direction of A. M. McDermott. The Sierra Madre Mining & Development Co., controlled by St. Louis capital, is also operating in four different districts near Choix, under the direction of A. W. Warwick, formerly of Colorado. The Pacific Exploration Co., also operating near Choix, is doing a great deal of development and experimental work, and the El Carmen Gold Mining Co., at San Lorenzo, is opening a large body of high-grade gold and silver ore in the San Manuel mine. The El Carmen mine, belonging to the same company, is being unwatered and re-timbered, preparatory to sinking the shaft another 200 ft., while grading is going forward for the erection of a cyanide mill. Only the lack of railroad facilities prevents the company from being a steady shipper. The Kansas City, Mexico & Orient Railroad will be operating to Choix by January 1. The Lolo Mining Co. is now operating the Lolo mine at Buenos Aires, near Cusihuiriachic, Chih. The mill has a daily capacity of 15 tons, and will be started up as soon as the rains begin. Upon the completion of the Mineral Belt railroad at Guanajuato the various mines of the Securities Corporation Co., Ltd., in the La Luz district, are to be equipped with new machinery, which will include a 1000-ton stamp-mill.

BUTTE, MONTANA.

Great Falls Smelter. — Parrot Mining Co. — Resumption of Amalgamated Mines.—Copper Trade Predictions.—North Butte Extension.—Butte-Montana Pool.—Barnes-King.

It is likely that the Great Falls smelter of the Boston & Montana Co. will remain out of commission another month, as the big flood did great damage to the plant. The Great

Map of Butte District.

Northern railroad between Butte and Great Falls is open again, after having been tied up through washouts for more than three weeks. With the exception of the Boston & Montana Co., all the subsidiary companies of the Amalgamated are again running full capacity, and so are the North Butte, Butte Coalition, and Original companies. The June copper production will likely fall below 20,000,000 lb. because of the interruptions by the floods.

The Parrot Mining Co. has not yet reached normal production, but is conducting development work on the lower levels with the object of opening the veins down to the 2000-ft. level. In the Parrot property the mining is confined to the 1200, 1500, 1600, 1700, and 1800-ft. levels, the ore being low-grade. There is a body of high-class ore on the 1200-ft. level, which was left undisturbed a long time on account of the extreme heat. About 7000 men are now employed in the Amalgamated mines, since mining has been resumed in the Neversweat, West Gray Rock, and Mountain Con. mines. The Mountain Con. is working through a shaft 2200 ft. deep, and will yield about 500 tons of ore per day when operated at full capacity. At the Gray Rock the old steam plant has been replaced by electric equipment. The Amalgamated output is about 8500 tons of ore per day, to which the Anaconda, Boston & Montana, Butte & Boston, Trenton, Parrot, and Washoe contribute.

Ex-Senator W. A. Clark says: "I do not look for any marked improvement in the copper trade until industrial conditions get back to normal. Our export trade keeps up well, but the consumption of copper in the United States is far from what it should be. We cannot expect conditions to improve much in the metal trade until the factories at home are turning out engines, cars, and machinery that require copper in construction, such as electrical machinery and everything connected with electrical installation. In other words, the industrial conditions all over the country must improve before we can look for improvement in copper. Most of the trouble with copper now seems to be at home, and until our local industrial conditions grow better

Anaconda Hill, Butte.

there cannot be much improvement in the copper trade." Mr. Clark said he had no information of any movement among copper producers to form a combination for the regulation and control of output and prices.

The Cooke & Montana Mining Co. is making preparations to begin operations in the New World district, near Cooke City, where activity has been stimulated by a proposition to build an electric railway from Columbus to Cooke. The property has been opened by an adit and drifts at a vertical depth of 300 feet.

Butte officers and stockholders of the North Butte Extension Copper Mining Co. are still without information as to the reasons for the sensational drop in the price of the stock on the New York curb, and the failure of the company to pay its most pressing debts. The property of the company in Butte is in good shape, and intrinsically the stock is worth many times more than it was when selling at $3 and $4 per share. The total indebtedness now due is not more than $12,000, though the company owes something on the purchase price of some interests in different claims. There are five known veins in the company's ground, including the big Blackrock vein. President Van Brunt and his associates have already put $350,000 into the company, in the purchase of property, installing a plant, and doing development work.

The Butte-Balaklava Mining Co. is continuing development and has its shaft down 700 ft. Cross-cutting is being done on the 700 and 500-ft. levels. In the course of development some ore has been taken out, and several carloads are in the bins. It is also announced that the company has decided to erect a steel head-frame, to take the place of the

wooden one, the new one to be provided with self-dumping skips similar to those in use at the large mines of the district. The carpenter-shop has been provided with electric automatic sawing machinery.

The new-process zinc plant at the Lexington mine of the La France Copper Co., has been shut down temporarily. For some time it was run only half-time, though the company has refused to purchase custom-ore, many lessees about Butte being anxious to sell ore to the plant. The injunction and damage suit brought against the company by people who reside near the mill is presumed to have had some influence on the suspension of operations. The company has been unable to pay its running expenses for some time, which makes it appear that the new zinc-separating process has not yet proved a success.

The Butte-Montana Mining Co. is urging stockholders to join a sellers' pool which some New York curb-broker is trying to organize. The stock is selling on the local market at 30c., and stockholders are promised 75c. per share, at which price the brokers promise to sell the stock of the shareholders pro rata after the brokers have sold the treasury stock, which they have agreed to take if the pool can be formed. The company owns the Alex. Scott mine, adjoining the Colusa of the Boston & Montana Co. The latter company has been sinking the Alex. Scott shaft to connect with the Colusa for ventilation, and it is down 1200 feet.

The Barnes-King production was greatly curtailed in May, and is curtailed even more during June on account of heavy rains. The latest monthly report for April shows 6445 tons of ore mined, of which 10% came from the south end open-cuts and vicinity, above the 200-ft. level; 62% from the north end open-cut, and 28% from the Santiago orebody. In the mill 6445 tons of ore were crushed and leached, the heads averaging $4.19 per ton and the tails 87c. The leaching has been a little unsatisfactory, the fine material from the north end giving quite irregular results. The bullion output for April was 2,130.42 oz., netting at the United States assay office $25,798, less $131 for assaying. No statement is made of expenditures, but it is understood that the earnings were a few hundred dollars in excess of the cost of operation.

The Anaconda Co. has for some days been engaged in reopening the Modoc mine. A new head-frame and 100-hp. electric hoist have been installed. The mine will be opened principally for ventilation and safety, as it is connected with adjoining mines of the Anaconda Co. The Modoc shaft has three compartments and is 1000 ft. deep. The report comes from the East that the Pittsburg & Montana Mining Co. is being reorganized. The mines and the smelter are running at their full capacity of about 150 tons of ore per day. It is also reported that the Curtis-Majors Mining Co. has been financed, and that development work on its properties in the southern part of the city may be started soon.

SALT LAKE, UTAH.

U. S. Smelting, Refining and Mining Co. Accepting Ore. — Tintic Smelting Co. — Taylor & Brunton Sampling Co.—Low Costs by Utah Copper Co.—New Concentrator at Park City.

The fact that the United States Smelting, Refining & Mining Co. is accepting ore again is taken as evidence that the Bingham Junction lead smelter is nearly ready to resume operations, but this time guided by the regulations provided in the modified decree issued from the Federal Court. The closure of the plant about six months ago was a result of the adverse decision in the noted smelter-smoke cases.

Last week the ore-purchasing department received consignments of ore from the Mammoth and the Grand Central mines in the Tintic district, with several additional lots from the southern Nevada camps. The management, nevertheless, is unwilling to name the date on which the fires will be actually kindled, saying only "it will be some time in July." There is no doubt that the long spell of rainy weather has greatly interfered with construction, but the skies have cleared and work is being pushed vigorously. For like reasons, the building of the new lead-copper smelter in the Tintic district has been materially handicapped; but the management gives assurance that certain troubles in the original design have been overcome, and that the initial unit of the lead smelter will be placed in operation within three weeks. The copper furnaces, however, will not be ready before September. The Tintic Smelting Co. last week placed orders for additional equipment sufficient to double the capacity, particular attention being directed to the copper department. When completed, the plant will handle form 600 to 800 tons of lead ore and from 500 to 600 tons of copper ore per day. It is strongly hinted, since this move was made, that the Tintic company is to become an ally of the United States Smelting, Refining & Mining Co., but the report still lacks confirmation. Coincident with the letting of the contract referred to, the Taylor & Brunton Sampling Co. announced its intention of building a sampler in the Tintic district to begin with a capacity of 600 tons of ore per day. It now seems likely that the railroads will grant the request made of them for common-point freight rates for Tintic. Lack of this advantage has heretofore stood in the way of making the Tintic district an important smelting as well as mining centre. In many respects the location is ideal for a large smelting enterprise, being remote from the farming districts and accessible by both the Harriman and the Gould railroad systems. The Ogden smelter, operated by the Independent Smelting Co., will resume treatment of custom copper ores this week. The plant is equipped with one copper matting-furnace. The ore congestion at the Garfield smelter of the American Smelting & Refining Co., is still unrelieved, but more furnaces are being added to the equipment and it is anticipated that the demands will be fully met by next autumn.

The successful achievement of the Utah Copper Co. in May has attracted widespread attention in copper circles. During that month 4,139,529 lb. of copper was produced, at a cost of 7.7c. per lb., as against 3,323,000 lb. in April, at a cost of about 8.2c. per lb. The June record will apparently be still better, as the tenth section of the Garfield concentrator is now in commission. A quarterly statement, giving details regarding the company's operations in Bingham, will be issued to the shareholders shortly after July 1.

The American Flag Mining Co., at Park City, will begin the construction of a concentrating mill at its mine in the near future. Until the recent restoration of the Ontario drain-adit, this company, like others in the district, was unable to operate the deeper portion of its mine. Last week workmen reached the face of the adit run into the Daly West Co.'s ground, and the plan outlined several years ago to develop the mine at that depth will now be carried out.

Samuel Newhouse of Salt Lake recently acquired an interest in the Prince Consolidated mine and other properties in Pioche, and has announced his intention to build a smelter in the camp in the near future, the initial unit to have facilities for treatment of 500 tons of lead-silver ores per day. Mr. Newhouse asserts that the plant will also do custom work.

The Uncle Sam Consolidated Mining Co., operating in Tintic, paid dividends last year to the amount of $70,000. Ore shipments amounted to 112 carloads, netting $25.42 per ton, or $102,752. Production ceased November 15 last, owing to the smelter-smoke casts, which resulted in closing down the Bingham Junction smelter.

At meetings of shareholders of the Swansea and South Swansea mining companies the consolidation and organization of the Swansea Consolidated Mining Co. was ratified. The property involved is located in Tintic.

In is probable that work will begin on the reconstruction of the Sunshine mill, near Mercur, about July 1. The Sunshine mine contains a large tonnage of low-grade gold ore, which the former owners were unable to treat successfully. Some time ago the mine came into the possession of parties identified with the operation of the Consolidated Mercur Mines Co., who concluded that the difficulties were surmountable by the Consolidated Mercur mill methods.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Scale prevention by the use of boiler compounds is more effective if the chemical, whatever it be, is added continuously in small quantities.

A hard surface and a soft centre for a large mandrel, punch, or die may be secured by giving the tool a quick surface heat, the core remaining comparatively cool, and then plunging it into a cooling bath.

Phonolite has so pronounced a tendency to split into thin sheets that it is often called porphyrschiefer and hornschiefer by the Germans. The Bohemian occurrences of phonolite possess this characteristic of fissility in a more marked degree than deposits elsewhere.

Keys for fastening pulleys to shafts should have a width equal to one-fourth of the shaft-diameter, and a thickness equal to one-sixth. They should be tapered $^3/_{16}$ in. per foot. The depth of the key-way in the shaft should be equal to two-fifths of the key at its thickest end.

Selenium, because of the peculiar fact that its conductivity is very much decreased in the absence of light, has led to a number of novel uses, among them being the automatic lighting and extinguishing of gas bouys, and for measuring the quantity of Roentgen rays in therapeutic applications.

Self-glazing fireproof clay for making crucibles, retorts, or for lining furnaces may be made, according to a recent English patent specification, of a mixture of dried and powdered common clay, finely ground sand, and rock salt, in about the proportions of 66 lb. of clay, 46 lb. of sand, and 9 oz. of powdered rock-salt, mixed with water.

United States standard thread differs only from the V-thread in that the sharp top of the latter is cut off and the root between two adjacent threads is filled in. The amount taken from the top and added to the root is one-eighth of the height of the V-thread, thus making the height of the U. S. S. thread three-fourths of the depth of the V-thread.

The Wye level consists of a telescope mounted in a pair of vertical Y-shaped supports (from which it may be removed), with a spirit level attached. The Dumpy level differs from the Wye level only in having the telescope immovably fixed to the supports. As usually made the latter gives an inverted image of the object. Of the two, the Wye level is easier to adjust, and more often needs adjustment.

Magnesium salts are the most highly corrosive of the substances usually found in the waters of springs or streams destined for boiler use. In addition to their indirect corrosive action, if magnesium sulphate in any considerable amount be present with lime carbonate, 'hard-scale' will be deposited, the hard-scale consisting of lime sulphate which is precipitated, while magnesium bi-carbonate is formed in solution.

Angular convergency, a, of two meridians is $m \sin L$, where m is the angular difference of the longitude of the meridians and L is the mean latitude of the two positions. The linear convergency, c, for a length, t, is $t \sin a$. For latitude 40°, the difference in length between the north and the south sides of a township (six miles square) is 39.6 feet. One degree of longitude at a latitude of 40° is equal to 53.05 statute miles.

Slip in a leather belt is usually caused by the belt being too loose or too narrow. Heavy belts should be drawn together in place on the pulleys, when they are to be laced, since the edge of a wide tight belt is invariably stretched when run onto the pulleys, giving a tendency to the belt to run to one side, as well as to slip. When a belt becomes dry and loses its pliability, put on a mixture of tallow, castor oil, and a little bees wax, but never any mineral oil.

Heating small tools for tempering in a bath of sand is an excellent method. A suitable tray covered with about one inch of pure white sand, supported over a series of gas burners, is employed. By first burning all the impurities out of the sand, false colors will not be shown on the articles being tempered. The article, if small or thin, can be laid on the top of the sand, but if large it should be buried in it, only a small part of the surface being exposed to show the starting of the color.

Case-hardening of iron and mild steel is a process whereby the surface of the work is converted into steel and hardened. This is accomplished by heating the work in contact with a material rich in carbon, which gives up its carbon to the work. Small pieces may be case-hardened by the following method. In a suitable crucible, melt equal parts of cyanide of potassium and common salt, taking care not to inhale the fumes, which are poisonous. When the fluid has attained a bright-red heat, immerse the articles in it for five or ten minutes and then transfer them to a deep tank of water.

Llamas are able to carry a load of 52 kg. (equivalent to 114.4 lb.) from 12 to 15 miles per day of 12 hr. over mountainous trails reaching altitudes often as great as 16,000 ft. One freighter takes charge of 50 animals. The average life of a llama is from 6 to 8 years, beginning to serve at 2 years of age, but they can only be employed about 15 days in each month. They will thrive upon inferior pasture where most animals would starve. Llamas sell at prices equivalent to $3 to $5 gold. The hair is made into ropes 25 to 30 ft. long, which is used to fasten on the loads in packing. It is also woven into mantles, and the hide with the hair on makes a soft beautiful rug. The dung, like that of the camel in the Orient, is dried and used as fuel. In Peru it is called 'taquia,' and is employed even in reverberatory furnaces. It sells at $5 to $7 gold per ton.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Sidelight on History.

The Editor:

Sir—The elevation of Theodore Roosevelt to the Presidency of the United States was a result of the discovery of the silver mines of Potosí in the year 1545. When Pizarro had conquered the Incas, and was building Lima, he sent one of his brothers to take possession of these already famous mines, which were soon made to yield enormous riches. One-fifth of the silver produced was paid as royalty to the Spanish Crown. What the kings of Spain drew, first and last, from Potosí, can only be guessed at; but official figures show that for one relatively short period, from 1566 to 1615, their royalty amounted to 259 millions sterling. It is certain that Potosí gave more wealth to the kings and people of Spain than did all other American sources put together, and for many years after its discovery Spain was able to hold the supremacy of the world.

History and observation show us that the Spanish people during this period could not have been the greatest people in the world—they were only the richest. Their kings, also, absolute in those days for good or ill, were one and all steeped in bigotry and superstition. Under rulers of this type, or with a people lacking the inherent qualities required for world-progress, Spain should have quickly fallen back. She did not, till later—because her kings were immensely rich, with the riches of Potosí, and could make their money effect what their characters lacked. Spain's wealth was mistaken for real power. Poorer countries became her satellites, and her money no doubt cemented the alliance with Rome and with Rome's powerful lever, the Inquisition. As wealth poured into Spain, her prestige, in a poverty-stricken Europe, rose ever higher. She was feared at home. Abroad there was none to oppose her. What simpler, then, than her wholesale policy of annexation. Peru, the whole of South America except Brazil, Mexico, and the countries to the north, Central America, and the islands of the Caribbean were taken one after another. But Spain's seemingly wonderful hold on the New World was more or less an accident. Her colonizing was only made possible after unheard-of cruelties and wholesale murder of the Indians, and had it not been for the wealth of the mines, the expeditions would have returned in disillusionment to Europe. But with such great riches pouring back, everything became possible. Spain kept her position in Europe. She made the Church her first ally. She kept the poorer nations in fear. She controlled the sea, and no one dared interfere with her great schemes in the West. In due time she owned nearly all America. It looked wonderful; but it was unreal. Stripped of their wealth and prestige neither the kings nor the people of Spain were fit to inherit the Empire which accident had made theirs. It was the wealth of Potosí, not the qualities of her people, which gave Spain her American colonies and enabled her to retain them. But for this wealth, securing her prestige and powerful allies, Spain would have had at that time to share the New World with Portugal, Holland, France, Austria, and perhaps even England—all fitter nations to retain and develop colonial possessions. Without her wealth, which blinded Europe to her true status, her inefficiency as a colonizing power would soon have shown itself, and as effeteness overtook her, her American possessions would, one after another, have passed in those early days into more capable hands.

My argument then is this: The tremendous grip Spain got on America was due, more than anything else, to the mines of Potosí. If there had been no Potosí, there would have been no Spanish empire in America. True, Spain might in the beginning have owned possessions here and there; but because of her incapacity to govern and develop them, these would have been gradually wrested from her. Thus, at this much later date, there would have been no war between Spain and the United States in the year 1898. The rest is soon told. It was that war which gave Roosevelt the opportunity, which otherwise might never have come to him. Heroism in the field, backed by a strong personality, secured him the popularity which carried him to the Governorship of New York State; while his peculiar efficiency there carried him to the Vice-Presidency. McKinley's death, it seems to me, only hastened his elevation to the highest post.

The Presidency of Roosevelt is a strange link in this chain of cause and effect. From 1545 to 1908 is a long time; but who shall say that the discovery at that mountain in far-off Bolivia has ceased to be an influencing factor in great affairs, or that the dynamic forces then set in motion are not destined to influence history as much in the future as in the past. It seems to me that the discovery of Potosí has vitally affected the history of all America, of Spain, and of the Catholic Church. Closer enquiry would, no doubt, show us that it had greatly affected the history of the whole world. Today the people of Potosí, still 150 miles from any railway, conduct a respectable tin-mining industry, and produce only a little silver; for tin is high and silver is low. There is a great deal of tin and silver ore still to work, but it is unlikely that the mountain will ever again flood the world with wealth. Taken all in all, Potosí has been one of the wonders of the world, and has exercised enormous influence on the fates of nations.

J. H. CURLE.

Valparaiso, May 11, 1908.

Mining Law.

The Editor:

Sir—It is evident from the letter of Charles H. Shamel in your issue of May 23 that he is an ardent champion of the 'law of the apex'. Until I saw this letter I did not know that Mr. Shamel had previously referred to my criticism of the apex law in *Economic Geology*. Having now read with care his contribution to the discussion in the journal mentioned, and his recent letter in the MINING AND SCIENTIFIC PRESS,

I must still beg to maintain my position with reference to the question in hand.

The discussion on this subject has been long, and the two parties, defenders and opponents of the law of the apex, appear to me to have presented a sufficient amount of evidence to have exhausted their ammunition, as it were. If it were conceivable that the case could be presented before such an international tribunal as I have previously suggested, the pleading on both sides being weighed, I believe that the opponents of the law of the apex have nothing to fear. Before the court aforesaid I should be bold enough to hope that my small portion of the sum of evidence already presented, together with Mr. Shamel's specific attacks on my several exhibits, would obtain a hearing.

It is gratifying to know that in the case of our valuable possession, the Philippines, the mining code recently drafted follows the general precedent of rights restricted to vertical boundaries on four sides. In the United States it seems improbable that any fundamental change in the provisions of the apex law is to be expected. It is also to be feared that a continuation of the discussion concerning this vexed question will result in nothing more profitable than the intellectual pleasure which it affords to the participants.

C. W. Purington.

London, June 7.

The Editor:

Sir—I have noted some recent discussion in your paper with respect to the apex law, and if you will permit me, I must offer some exceptions to the attitude assumed by your correspondents. I have had many years' experience with and many years' litigation over extra-lateral rights, and at times have been almost converted to the advantages of the Mexican and Canadian law; further thought, however, has shown me that they are hardly any better than the American. Now the only remedy that I have seen proposed to mitigate the evils of extra-lateral rights is the revoking of that law and the limiting of rights within vertical lines; but I am forced to contend that one alternative is as bad as the other; both are right and both are wrong; therefore we must look to a compromise between the two. A little actual experience in the courts with the ownership of valuable mining ground at stake, will at once show us the fallacy of the assumption that the decisions of State and Federal Courts have cleared up the inaccuracy, looseness, and vagueness of the mining statutes. A few good points perhaps have been made, but in many cases there is no definite rule at all, and as a result justice becomes debased into personal opinions, and often the prejudices of a judge or jury left to interpret the miserably elastic statutes whatever way he wishes. The decisions are far from satisfactory.

But your correspondents have not gone far enough in their reasonings, and a deeper insight into the rights and wrongs of the apex law will bring us to a new conclusion. We are told that the vertical-lines doctrine is unfair and checks the development of good mining territory. Why? Because if a man owns a claim 600 by 1500 ft. and has a lode cropping strongly on the surface, he is not going to expend a large sum of money to open it up, when it is likely to dip right out of his ground and into his neighbor's at any moment, and leave him with little or no compensation for his work. Therefore it is argued the law of extra-lateral rights should be left in force, and there the reasoning stops. It is for this purpose that I have written you, to ask your readers to go further. What about the man who locates a claim side-lining the one we have just discussed? Smith locates the Bessie B. claim, and you give him extra-lateral rights to follow his vein anywhere, so he will be justified in developing his ground. Now Brown comes along and locates the Katy K. claim alongside of the Bessie B., both lodes showing strong croppings, with distinct strikes, but of course no positive proof of dip because of a possible 'buckle' in the vein, or other irregularity. Brown has as much money as Smith, he is as well able to make a producing mine as is Smith, and he should have exactly the same inducements and certainty of reward. Is that the case under the present apex law? We must answer, "No." If Smith's vein dips into Brown's claim and both veins should unite, Smith gets everything from his apex to unlimited depths, and although Brown has spent as much money as Smith, he only gets to the point of junction. The law works both ways; and after years of experience with laws of the United States, Mexico, and Canada, as a mining detective and operator, I have come to the conclusion that we should find a new solution for the troubles resultant from the vagaries of veins. Either the apex law should persist, with the qualification that if two veins unite on the dip, the work must be carried on jointly below the point of junction, with equal division of profits, or else mining claims should give a sufficient width of ground on each side of a vein to cover a large area on the lode on its dip. A claim should be 1000 ft. long by 2000 ft. wide. Most locators stake out two or three claims in any case, so why not take advantage of that fact and authorize a claim equal to two or three present claims in width. This would do away with most of the trouble. It is not necessary to upset the entire statute, but make a few necessary changes.

C. J. Kennedy.

Seattle, Washington, June 11.

Graft in Sonora.

The Editor:

Sir—In an editorial on the Yaqui trouble in Sonora, in the issue of June 6, 1908, of your valued paper, I note that you make several rather unfavorable indirect remarks concerning the Mexican officials, and if I am not mistaken, in another recent issue, you compared them to your old 'Frisco' officials. I would like further information citing exact cases where the officials have been guilty of grafting, etc. I am also aware of the fact that "certain men" seem to be inclined to make a great many "remarks" concerning the Mexican soldiers, officials, and system of government in general.

The story that army officials are grafting reminds me of a story told of a United States officer who was exploring in the Southwest about a quarter of a century ago. It seems that a pack-mule went over the precipice and the pack was never seen again. When he came to make up his 'returns' he 'loaded' all his 'unaccounted fors' on that unfortunate mule. I do not remember how much it was, but think that it was about a carload of 'stuff'. Upon receipt of the report, the quartermaster general promptly telegraphed him to buy 1000 mules like the one that went over the precipice. From this time on the United States officers have had another way to 'account' for the 'unaccounted for' supplies, etc., besides the time honored quarterly garrison fire. From what I have seen, it seems that the two stories are about of equal weight.

Regarding the Mexican soldiers, I have found them to be brave, good shots, keep their rifles in good shape, and keep a good supply of ammunition on their persons. To be sure, they are not dandies when campaigning in an arid country where it is often impossible to get enough water to wash their faces. I do not recall the soldiers losing a single American or foreigner that they were escorting, whereas I know of quite a number of different Americans that did not and would not take escort and were killed by the Yaquis. I am under the impression that the Mexican soldiers are far more active in the pursuit of the Yaquis than you are giving them credit for. It must also be remembered that the Yaquis are intelligent, strong, have great power of endurance, and are remarkable travelers. Col. Powell in his 'Customs of the Service' says of the Mexican soldiers, they live on tortillas and frijoles, and stand the hard campaign without much sickness, especially from dietary causes. Ask any old officer what that means. Several years ago I was going to Sinaloa, by way of Guaymas; at Hermosillo the train was delayed, and I, in company with the others, commenced to look around; about the first thing that attracted our attention was several box-cars filled with Yaqui prisoners of war guarded by Mexican soldiers. It soon became evident that we would be tied up for some time, and being about midday in the late summer, it was decidedly warm. The captain of the soldiers took the Yaquis under guard and put them in the shade of the depot, and kept them there until the train was ready to leave. The Americans were quite surprised that a Mexican soldier should be so considerate of others.

Regarding the Mexican system of government and officials. They seem strange at first, but I have found the officials usually honest and square in the discharge of their duties, and I think that many parts of the Mexican system of government could be copied with great profit to ourselves. I seriously doubt if there is any foreign country where we can get as near the square deal as we do in Mexico. As to tying up the country, I do not believe it possible to keep the American prospector out of hell if someone would show him a little gold and tell him that he got it there. When the prospector finds 'colors' and the miner gets a sufficient showing, we will put in a railroad or suitable transportation system. It does not matter if they cannot get a pack-mule into the district before we get our lines in operation.

Speaking of railroads reminds me that under your Guaymas correspondence some time ago, you made some remarks regarding poor construction of the F. C. de C. R. Y. y P., which is now building down the west coastal plain of Mexico. Among other things you said: "Construction is crude, all cuts of more than a metre being 'shoo-flied' and gulches crossed on cribbed ties." It takes an average cut or fill of 7 by 10 ft., with the accompanying opening, to equal the cost of the track complete, depending somewhat on the locality and other things. Roughly, this is about one-half the cost of a railroad. This shows the absurdity of the first part of your report, and as to the second part, we always, especially in an arid country, try to keep the rails up to the end of the finished grade, so that we can get supplies and water easily. It is comparatively easy and costs almost nothing to build a little cribbing of ties, and take the steel across the arroyo. Then at our leisure we can dump the bridge material and other supplies from the cars and build the bridge. This saves expensive handling, tram haulage, and breakage, and keeps the work better under control of headquarters.

CHARLES KIRBY FOX.

Pomona, California, June 8, 1908.

[We congratulate our correspondent on his intent to defend the Mexican Government against unjust criticism, since such a spirit is not often enough in evidence among our countrymen. Our comments on Mexican banking in the issue referred to show clearly the high regard in which we hold our neighbor Republic. We are not criticizing that Government, nor did we intimate the inability of the Mexican soldier to suppress the Yaquis if given the opportunity, under a well-planned campaign, to do effective work. We merely directed attention to the notorious grafters who have brought reproach upon northwestern Mexico for many years. We are ashamed that even the lime-light which has been turned upon the corruption in San Francisco has not illuminated the dark places and rendered dishonesty impossible, and we are aware that a host of right-minded gentlemen in Sonora deplore the evils which have continued in their midst through the degrading influence of graft-money. Unfortunately, in Mexico as in the United States, the better citizens are less likely to be in power than those who have more selfish aims than that of good government.—EDITOR.]

Producer-Gas.

The Editor:

Sir—Ancient tradition and mythology record that the giant, Typhon, cut out and carried away Jupiter's sinews, which Mercury afterward stole and restored again to Jupiter, thus giving to the king of the gods the means for his victory over his rivals. It is not a far-fetched figure to say that our modern Jovian manufacturer is fast losing his sinews, and in his struggle for cheap power is running a fair chance of defeat, unless some Mercurial spirit of invention shall come to his assistance with the wit,

born of necessity, and the determination sprung from faith, to command success. For the seeker after cheap and reliable power, these sinews of strength are to be found in the gas-producer and the gas-engine.

Producer-gas is a very real thing, though it has baffled the best wit of many an attempted definition. Perhaps we may say that producer-gas is the partly burned complex mixture of gases made by the complete breaking down of the structure of fuel under the combined action of air and steam at an elevated temperature. Thus anthracite-coal gas from the producer leaves a fuel reduced to ashes; but the gas itself is consumed only to the extent of losing about 15% of the power originally available in the coal. With softer fuels, there is liable to be more volume of combustible matter in the resulting gas, though it does not always follow that less than 15% of the power originally resident in the fuel is charged off for changing the fuel into volatile form; but, at all events, the resultant gas is rich, and the commercial possibilities are worth much effort. It will take any good student—the practical man, I mean—a year to master the principles of the gas-producer and the gas-engine, so that he can eat, drink, and sleep on them by instinct. I do not mean that a man can not learn to run a good gas-producer or a good gas-engine, or both, in a few days. Any good man can run these mechanically, after a few hours of study and observation; but to know all the turns and twists of the nature of this kind of furnace and machinery, so that he can repair it at a moment's notice, that is art; and therein the artisan becomes an artist. And this feeling of something strange and foreign about the gas-producer and gas-engine, is right and wrong at the same time; it is right in the sense that there is something to be studied; it is wrong in the sense that there is nothing which a good man cannot master in a few months. Let a story point a moral and adorn a tale. In dealing with a recent customer, things came to a hitch, but I kept after him, wondering just what was holding him back. The case had all the aspects of a good proposition; the man had the need; he had the interest; he had the money; he had the engineering requirement of floor-space and head-room; he almost had the 'sand' to close the deal and sign the contract; but his wise common-sense held him back—he wanted to know more about it; and it came out in this way. One day he had run in on us for about the fifteenth time, and was studying the gas-engine. As usual, all was going well, and I was assuring him for the tenth time that there are no 'big niggers in the fence' in a good gas-producer proposition, when all at once the little giant gave a sigh, a few convulsive gasps—and stopped! I was just on the point of explaining that the plant had just the same proportion of 'little niggers in the fence' as the same quantity of machinery anywhere else; and I was mentioning the sparking attachment as the first thing that one would look at in such an emergency. Well, we got up and strolled out to the engine-room. The engineer (who works up on the third or fourth floor) had not yet arrived, but came in shortly after us. My customer turned to me and said, "Well, we couldn't stand for this kind of thing; our daily paper would be ancient history tomorrow, if our printing presses should stop this way. I suppose that it will be an hour or two before you get her started up again." "Oh, no," I replied. "It will be started up in a few moments," and it was. He decided to stop and see the engine started; it was only a broken spring on the jump-spark apparatus. The engine was started in five minutes, and my customer went away, but not before he had decided to close the contract. In his case, as in the cases of thousands of others, there was hesitation leaning on ignorance, ignorance of the small but vital details that someone must know; and taking the story for what it is worth, it shows that there is a certain familiarity that must come before real success will follow. Are the manufacturer, the superintendent, and the progressive man going to hold back? Are they going to defer, and defer, just because there is something that they must learn, not only from the books, but also from experience? For answer, see what is being done, in actual power-economy as compared with the best that the century-and-a-quarter of steam practice can do. From San Mateo to South Buffalo, and from Gary to Seraing, there comes the bustle of progress, progress that is too real and too busy to waste time with the timorous, but that advises us all to get ready for what is coming our way; and among the good things there are the gas-producer and the gas-engine for the large and the small manufacturer.

Boston, April 13. CHAS. S. PALMER.

Record progress in underground driving is reported as follows, in a recent number of the *South African Mining Journal*: "Two miners, named Kerr and Maud, drove a connection, on the fifteenth level, between the Clement and the Rudd shafts of the Simmer Deep, a distance of 294 ft., in 61 consecutive shifts of 10 hours each, terminating with the end of April. The size of the drift was 5 by 7 ft. One white man and six Chinese were employed on each shift, and they operated three Ingersoll-Sergeant rock-drills on a bar. One round was drilled per shift, and the average footage per round was 4.82. The number of feet broken per case of gelatine consumed was 4.52, and 11.06 lb. gelatine were used per foot. Of the 61 rounds drilled, 59 had 14 holes each and two had 12 holes each. The air-pressure at surface was 80 lb. per square inch. This is exceedingly good work, and reflects the greatest credit not only on the men who drove such a remarkable footage, but also on the management of the mine and the Ingersoll-Sergeant Drill Co. Such work has certainly not been equalled on the Rand, and we believe that it stands not only as a record for South Africa but for the world. It is interesting to note that special measures were taken to cool the drift after blasting and to eliminate dust. A water-pipe was connected with the air-pipe, so that the drift could be cooled and the stuff wetted without loss of time. After blasting the 'cut' water was forced by the air into the face, so that the contractor on returning to blast the round found the drift quite cool and free from dust."

GOLDFIELD, NEVADA.—VI.

Automobiles and Gambling.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Mention has been made of an automobile road between Goldfield and Tonopah. The automobile is the symbol of the restless energy of these Nevada mining districts. In a bygone time men went forth to explore in sailing ships; in Mexico the mule typified transport; in the old West the patient little burro has been the mainstay of the prospector; in the North, the dog-team and the reindeer aided the mineral explorer; in Western Australia we used to ride on camels across the desert in which rich gold deposits were discovered; but in modern Nevada the mechanical genius of the age has given man a method of locomotion more swift and more flexible than any beast of burden. All the explorer needs is gasoline, instead of fodder or water. At Goldfield, gasoline costs 39 cents per gal. in cans, and 30c. in tanks. Early in the development of Tonopah, Goldfield, Rhyolite, and Manhattan the problem of rapid transit was solved by an automobile service connecting the important camps. The 28 miles between Tonopah and Goldfield has been made in 35 minutes. The usual time was 50 minutes. The regular fare used to be $6. The automobiles had three seats and carried 9 passengers apiece. In going over a bit of the old road, on the occasion of a visit to the Daisy mine, I asked Mr. C. Walter Geddes how the road was made. The automobile road between Goldfield and Tonopah was made by a stage company organized by L. L. Patrick, formerly of Leadville. First, the sagebrush was cleared by dragging a piece of T-rail placed at right angles to the line of the road. Then ruts were marked by taking an automobile over the cleared ground; along those ruts two heavy chains were dragged behind an automobile to establish a track. Another method is to take a scraper or go-devil, somewhat after the fashion of a snow-plough; this is dragged by 8 or 10 horses, so as to uproot the sagebrush and throw loose stones and other obstructions to either side. Then a double chain or pipe (6 to 8 in. diam.) is dragged over the ground; this makes parallel ruts, serving as a track of the correct gauge. The passage of the automobiles soon makes an excellent road, but after a while bumps or ridges are formed in the ruts. These riffles are of doubtful origin; some impute them to the vibration of the engine; it is probable that the traction or slip of the rear (or driving) wheels, or more probably the irregularities in tractive effort due to vibration of the sprocket-chain, causes a kick and so makes the corrugations, which gradually spoil the auto-road. When this has become a nuisance, it is customary to pull a pair of pipes along the road and smooth it. However, even with this precaution, an automobile road in the desert soon gets out of repair. Originally straight, every sway of the fast-moving machine causes a swerve from the direct line; the next machine follows its predecessor and accentuates the deviation, until the road becomes curiously serpentine, like the trails in an African forest, where the native steps aside for every fallen tree or obstructing stone, rather than clear the track and keep it straight.

The fare to Rhyolite from Goldfield (65 miles) used to be $25 for a single passenger; it is now $4.55. The railroad killed motor travel, as might be expected. Drivers of automobiles receive $8 to $10 per day, and most of them are skillful chauffeurs, both to steer and to repair. Local newspapers call them 'mahouts,' a Hindustani term borrowed from elephant service, and absurdly out of place in the desert.

To use an automobile in traveling between the mining settlements is a comparatively new departure, but the most striking use of these machines is in hastening to a new mining excitement or 'rush,' so as to be early on the ground and locate a claim near the place of discovery. Even more than this, the automobile has been used in going across country, independent of any road, in order to see a new find of golden ore. For such work a machine with a high clearance is needed. Thus a party of mining men went 140 miles north of Tonopah across the sagebrush plain. The car hit a projecting rock, hidden in the brush; the front axle was bent almost double and a hole was torn in the crank-shaft case. These up-to-date explorers made a fire with sagebrush and straightened the axle by hammering it while hot with stones. The hole in the crank-shaft case was repaired with a piece of rubber, a part of a gunny-sack, the fragment of a coal-oil can, all of which was bound with baling wire. (Good old baling wire!) They made their return serenely. If they had not been able to make these repairs, their plight would have been serious indeed.

At Goldfield the horses have become accustomed to the whirring chug-chugging motor-vehicles, which were introduced almost as soon as the horses themselves. At Oroville, in California, there is a county law forbidding motorists to travel by day, and the time is coming when special roads will be built for this purpose all over the country, for the preservation as much of the macadam roads, which the automobiles are fast destroying, as of the comfort of those who do not happen to be in the motor-car. This reminds me of a visit to the copper mines of Michigan four years ago, when automobiles were new on the Keweenaw peninsula. Mr. John R. Stanton took me from Houghton to the Atlantic mine. The scenes by the roadside were like a continuous and screaming farce, threatening at times to turn into a tragedy. We met a dozen Cornish miners on horseback with tin dinner-buckets, and as soon as their steeds saw the machine there was a separation and scattering of Cousin Jacks, dinner-pails, and frightened horses among the rocks and brush such as no African lion could have effected. On the way we met farmers' wagons, country folk going to town, single horsemen, and in nearly every case there was a threatened mixing of the scenery and the wayfarers. I presume that long before this the inhabitants of the Upper Peninsula have become accustomed to the automobile.

At Schurz, on my return from Goldfield, I saw the rush to Rawhide. This new 'excitement' is 30

miles from Schurz, and the railroad station was crowded with automobiles awaiting passengers for the mines. The accompanying photograph shows how a Nevada rush is assisted by the automobile.

Last year ten or twelve men made a million or more apiece from the ore produced by the mines of Goldfield; of these, only five have retained their wealth. The others wasted their money, speculated wildly, got caught in the panic, and so forth. Men made money fast, but they also lost it rapidly by over-reaching.

At Schurz, on the Way to Rawhide.

On the train when I returned from Goldfield to San Francisco, there were two young brokers in our smoking compartment, and these two explained all that there was to know about mining and the business of mining. It was obvious that to them mines were made to serve as counters in a game of brokerage-finance; they themselves were the real thing; the engineers and metallurgists, even the mine-owners, were but the frill on the edge of things. The conversation drifted to gambling-saloons and it was stated how much money these establishments made, then it transpired that the proprietors of such places lost to the brokers by playing the stock-market, and finally the brokers got cleaned out by going into a lot of wild-cat schemes that exploded at the time of the panic last October. And, of course, the public lost. So everyone lost. "Where did the money go?" asked one of the smart followers of Philistine finance. It was then that I ventured to suggest to these patrons of mining, as they deemed themselves, that the money had gone into hot air. Whatever wealth had been created by the extraction of gold from the ground was still in existence, of course, but it was the difference between the intrinsic worth of the mines and the fictitious value placed upon them by flamboyant promoters and tricksters that had evaporated suddenly. It was like the settlement at the cross-roads where they passed a $1,000,000 note from one to another and thought themselves gorgeously rich, until they tried to discount that note on the outside in the purchase of a keg of beer. In New Mexico they tell a story of two Indians who invested their earnings in the purchase of a jug of whisky, intending to start a saloon and make a fortune. They were both very thirsty, and one of them had 5 cents remaining from his savings, so being thirsty, he insisted on buying whisky from his partner. His partner then felt dry, and used the same 5 cents to buy whisky from the first Indian. The exchange was continued actively until there was no more whisky in the jug. This story belongs to Charles F. Lummis.

Gambling establishments play a prominent part in the life of the mining community, and rank with the Stock Exchange as a place for the making and marring of a fortune. At the Goldfield Hotel the roulette wheel makes $11,000 profit per month nowadays, but this is small compared to the profits made by the leading gambling place, the Great Northern, during the boom days. Then on a capital of $100,000 the returns were as much as $50,000 per month. As far as I could learn, the maximum loss of an individual player was $50,000 and the maximum winning $30,000. The gambling is usually the sequel to a drunken spree, the men of sense and position who have "played the game" (roulette) will tell you that it was usually after "wining." 'Wine' means champagne. In the dry bracing air of the desert plateau, the stimulating effect of champagne is quickly felt

Broken Down in the Desert.

and soon develops intoxication. The hotel bar and the roulette table, the ordinary saloon and its gambling annex, are eloquent witnesses to the force of juxtaposition. Besides, the players receive drinks and cigars free, that is, they are given by 'the house'. This tends to keep the gamblers in a half-fuddled condition. Their stupidity plus the chances of the table are enough to make the game profitable to the proprietor. There are 36 numbers, besides a zero and a double zero; thus the margin for the house is 2 in 38, or 5.26% in its favor. As in the other game of chance—that of the Stock Market—the average player will quit when he has made a small winning, but he will take a large loss before stopping; thus the big losses are always smaller than the big winnings. Many a man with a few dollars jingling in his pocket will drop into a gambling saloon and "take a flyer"; when his pockets are empty he will go home; if he wins, he will remain until the luck turns and he has been cleaned out. Moreover, in betting on the black or red, the even or odd, the high or low, the bets of the players are apt to balance, and thus they save the liability of the house, which gets its 5.26% steadily from each play. The license fee is $75 per month per game. The dealers are paid $8 per day of 8 hours, the regular rate being $1 per hour. The proprietor has to pay interest on his bank roll, say, $50,000. He has to insure himself against robbery, which is frequent. Even today at the Goldfield Hotel, which in equipment and comfort and prices resembles a New York hotel, there is a man with a sawed-off shot-gun sitting behind a screen on a perch placed so as to command the bank-roll of the dealer at the roulette table. This savors of the frontier, as does the 25 cents for a shoe-shine and the 10 cents for a daily newspaper. The only alleviation is the fact that 'drinks' are two for a 'quarter.' When the 'thirst parlors' of a Western mining camp come down to "two for 25 cents," it indicates, strange as it may seem, the dawn of civilization.

By way of final comment on gambling as conducted in a mining camp, I venture to say that to bet on the red or the black is more sane than to buy shares on a margin and, upon the whole, the player at the roulette table gets a better show than the speculator on the stock exchange. Certainly, the game is far less crooked than that of the race-track and in itself is less insane. The evil of the gambling in a mining camp lies mainly in its associations, for the gambling annex stands mid-way between the drinking-saloon and the brothel. As a basis for betting, roulette has much to commend it, but as an instrument in debauching manhood it is altogether hateful.

The Japanese Imperial Iron Foundry, at Wakamatsu, is unable to compete with foreign imports of steel and iron because of the higher cost of production in Japan. A sum equal to over twenty-five million dollars has already been spent on the plant. The director of the foundry states that he is awaiting the lapse of the conventional tariffs in 1911, when it will be possible to impose duties on iron and steel.

MINING IN QUEBEC.

A review of mining operations in 1907, and of future prospects in the Province of Quebec, Canada, is presented in the annual report to the Government by J. Obalski, Superintendent of Mines. Asbestos was by far the most important mineral production, both in quantity and value. No less than 12 separate companies are mining this substance, among the largest being the Asbestos Mining & Mfg. Co., of Providence, R. I., operating at Wolfestown; and the Asbestos & Asbestic Co., whose plant is at Danville. Most of the asbestos mines are open quarries. With reference to gross value, cement, granite, bricks, tiles and pottery, limestone, mica, and lime, rank next, in the order named. Two new companies have started the manufacture of cement, making three in all, the centre of the industry being near Montreal. Of the metallic minerals, copper ranks highest, the principal producers being the Eustis Mining Co. and the Nichols Chemical Co., both in the Capelton region, Sherbrooke county. Of the 29,574 tons of ore mined by all companies, 19,933 was treated at Capelton and the remainder shipped to the United States. The pig-iron industry, ranking next in importance, is practically under the control of two companies: the Canada Iron Furnace Co., Ltd., at Radnor, and John McDougall & Co., at Drummondville. The 10,047 tons produced required for reduction 22,681 tons of ore, 11,511 tons of charcoal, and 4300 tons of limestone. Chrome iron was manufactured during the year by three companies in the township of Colraine. A summary of the total production of all classes of minerals is presented in the following table:

Mineral.	Amount.	Gross Value.
Asbestos	61,985 tons	$2,455,919
Cement		640,000
Granite	51,873 cu. yd.	560,236
Brick	94,000 M.	525,000
Tiles and pottery		270,000
Limestone	97,710 cu. yd.	223,580
Mica (trimmed)	550,247 lb.	199,848
Copper ore	29,574 tons	160,455
Lime	556,000 bu.	96,000
Bog iron ore	22,681 tons	80,231
Chrome iron	6,407 tons	63,130
Calcined ochre	2,300 tons	29,430
Asbestic	29,193 tons	27,293
Mica (crude)	150 tons	24,030
Slate	4,336 squares	20,056
Raw ochre	2,700 tons	5,400
Prepared graphite	120 tons	5,000
Phosphate of lime	408 tons	3,410
Flagstone	3,000 sq. yd.	2,550
Total		$5,391,368

It will be noticed that the above list includes neither of the precious metals. Mr. Obalski estimates that between 1863 and 1878 about $2,000,000 worth of gold was taken from the valley of the river Gilbert, but that since then mining has been carried on irregularly and on a small scale. He also suggests certain localities in which he thinks it might be worth while to prospect for gold.

The strength of copper is materially reduced at temperatures exceeding 500° Fahrenheit.

TREASURE MOUNTAIN, COLORADO.

Written for the MINING AND SCIENTIFIC PRESS
By C. W. PURINGTON.

Two and a quarter miles vertically above the level of the sea, in San Juan county, Colorado, cutting the top of the dome-like spur known as Treasure mountain, are five quartz-filled fissures of unusual width. Three have a northeast direction, and two a course of 25° north of west. Two of the northeast viens lie close together, as may be seen from the sketch (Fig. 1), so that the outcrops practically form a parallelogram, having angles of 65° and 115°, respectively, and the long diagonal oriented practically east and west. The short side is 1500 ft. and the long side 2500 ft. in length.

In their relation to the containing rock, andesite, and in mineralogical composition the veins are alike. Their most remarkable characteristic in the area of the Treasure mountain table-top is their width. This varies greatly, but in no observed case is it less than 50 ft. between walls. Since one of the veins, namely the Atlantic, forming the northwest side of the parallelogram is especially remarkable for its width, as also for other reasons, I use it as a type to describe the group in general.

Treasure mountain offers peculiar difficulties to geological investigation. Situated a distance of 12 miles north of Silverton, the district is not particularly easy of access at any time of the year, and generally heavy snow-falls conceal the outcrops of the veins except during the short summer. In the month of June the curious sight may be observed of beds of wild flowers hugging the edges of the daily receding snow-banks.

Descriptions of the geology of the Silverton region and of its metalliferous veins may be found in the excellent Survey reports of Messrs. Cross and Ransome. In the present paper I take up in greater detail a description of a small portion of that field.

The Atlantic vein, as mapped by Mr. Ransome, occupies a fissure along which faulting has occurred, seven miles in length, cutting Treasure mountain in about the median portion of its length. Farther to the southwest it is known successively as the Gold Prince and the Sunnyside. North from the Gold Prince workings, in Mastodon gulch, it crosses a high flat and cuts the shoulder of Treasure mountain, a huge solid wall of quartz, varying from 50 to 200 ft. in width. The outcrop may be followed along the nearly flat top of Treasure mountain, a distance of over 2000 ft., having a curious curve to the west going north. Breaking from the northeast slope of the mountain, the great vein may be followed down the steep slope toward the Animas river, a distance of 300 ft. At this point where the augite-andesite country of the upper mountain is underlain by the more silicious latite, the vein abruptly narrows to 10 to 15 ft. in width. Now for two miles northeast on its strike, during which the outcrop descends over 1500 ft. to the Animas canyon, and re-ascends into Cinnamon gulch, cutting only latite and underlying rhyolite, the Atlantic vein becomes merely a narrow seam difficult to trace. Still farther to the northeast the vein cuts Cinnamon pass into Cleveland gulch in Hinsdale county, wide and prominent. It here lies again in andesite and is known as the Isolde.

For the purpose of this paper, only passing reference to the valuable metallic contents of the vein is necessary. From the Sunnyside workings, at the extreme south end of the vein, gold, with accompanying silver, lead, and zinc, has been profitably extracted for several years. Twenty stamps were at first installed, later increased to 40, and more recently to 80. North from the Sunnyside workings, the vein was worked profitably first as the Sunnyside Extension, and has lately become known as the Gold Prince. The owners of the last named property have shown their confidence in the future of it by extensive development and the erection of a 100-stamp mill and two-mile aerial tram. On the extreme northeast end of the vein, rich gold shipments have been made from the Isolde workings.

The enclosing rock of this vein, as well as of others, above the general horizon of 11,500 ft., is dark blue pyroxene andesite. On Treasure mountain this andesite forms a nearly horizontal series of beds, fresh and massive in appearance, 1600 ft. in greatest thickness. The andesite forms the upper portion of the great series of andesite and rhyolite flows known as the Silverton series. On the northwest side of the fissure, a fault-throw has brought the Eureka rhyolite, an underlying member of the Silverton series, opposite the andesite; in fact, the fissure filled by the Sunnyside-Atlantic vein is a great plane of faulting, called the Cinnamon fault. See Fig. 2. Mr. Whitman Cross, in the 'Silverton Folio of the Geologic Atlas,' says of it: "The fault traced for the greatest distance may be called the Cinnamon fault, since it runs for a mile or more near the head of Cinnamon creek, being marked by a very prominent quartz vein. It is traceable without question, though not continuously, across the Animas and up a ravine to the north shoulder of Treasure mountain, and into Mastodon gulch. Near its western end, at the head of Mastodon gulch, it divides, forming a plexus of white veins in much altered rock, and it has been represented as identical with the Sunnyside vein which crosses into Eureka gulch. . . . Throughout its entire extent this fault is of much structural importance, as the map shows, the down-throw on the southeast approximating 1000 feet."

The essential point is that the country rock of this vein, occupying the Cinnamon fault, and of the other four veins referred to, is the pyroxene andesite, underlaid by lavas of more silicious habit, latite, and rhyolite successively. The fact that rhyolite is brought up by faulting to the northwest of the area in question is not important to this description, but the faulting is mentioned in order that the intensity of the original fracturing may be understood.

The appearance of the outcrop of the Atlantic vein on the top of Treasure mountain resembles a wide series of alternate bands of quartz and anthracite coal. This curious sight is the result of the peculiar weathering of the layers or partings of rhodonite, which form a large portion of the gangue in the Treasure mountain veins. A section of the vein was

measured in 1906 and gave a width of over 200 ft. The vein strikes N.50°E. and dips 65° southeast. The foot-wall side is exceedingly sharply defined. The containing rock is fresh in appearance and rings to the hammer. No pyritic impregnation is visible, and there is no solfataric decomposition. The quartz rises abruptly from the sod, the wall exhibiting slickensides. A zone of yellowish brown quartz containing crystals of fine galena and the decomposition products of this mineral, lies next the wall, and has a width of 20 ft. Next going southeast across the vein comes a zone 30 ft. wide of massive rhodonite, which, although weathering adamantine black on the surface, when broken is seen to be a mass of brilliant pink color, very tough to fracture. It merits the special description given below. Following comes a belt of white and decomposed quartz 60 ft. wide. The quartz, which is characteristic of all the outcrops on the mountain, varies from banded to vug-like structure, is white and lustreless on surface and generally yellow-brown on fracture. Intercalated black bands and lenses represent partings and inclusions of rhodonite. The eastern edge of this quartz zone is bordered by especially brown sugary quartz probably representing the fine galena and sulphide zone like that on the foot-wall. Next comes a still wider rhodonite parting, 50 ft. wide, separated by a dike of fine-grained blackish andesite from a quartz zone which lies next the hanging wall. The relations of the dike are not clear. It has a width of 25 ft. and is traceable only for about 150 linear feet. No similar dike appears accompanying any of the other Treasure Mtn. views, although, as mentioned below,

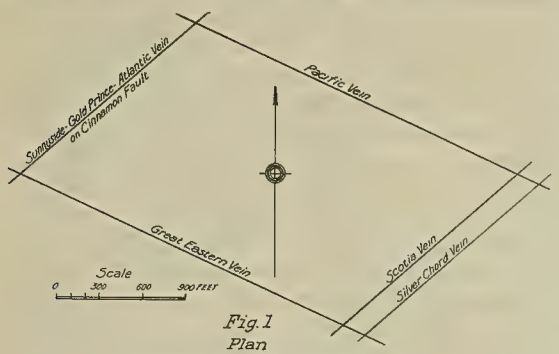


Fig. 1
Plan
showing the relative positions of the
Veins of Treasure Mountain
San Juan County, Colorado

a prominent dike of rhyolite crosses the Pacific vein.

The hanging-wall rock consists of fresh blue pyroxene andesite, entirely free, as far as can be observed, from decomposition products. The analyses of the Geological Survey show this andesite to have about 58% silica content and to be rather richer in potash than andesites generally are. It is the type of volcanic rock with which nearly all of the important gold orebodies of the San Juan region are associated. It forms all the upper portion of Treasure mountain, having there a maximum thickness of 1500 feet.

Before leaving the description of the gangue minerals of the Atlantic vein, the rhodonite should be especially noted. It characterizes the vein even in the deepest workings of the Sunnyside mine, now about 1000 ft. beneath the outcrop. It occurs in partings 30 ft. or more in width lying between the orebodies, and generally contains small scattered crystals of zinc-blende. Certain bands of it are sufficiently rich to form a zinc ore, which is treated separately. At the main level of the Gold Prince workings, 12,300 ft. above the sea, in Mastodon gulch, I saw in a 90-ft. cross-cut of the vein a solid wall of this rhodonite, 30 ft. wide. In this perfectly fresh state seen underground, it resembles, where powder-smoke does not obscure it, a wall of pink ice-cream. Although gold is not found in the rhodonite itself,

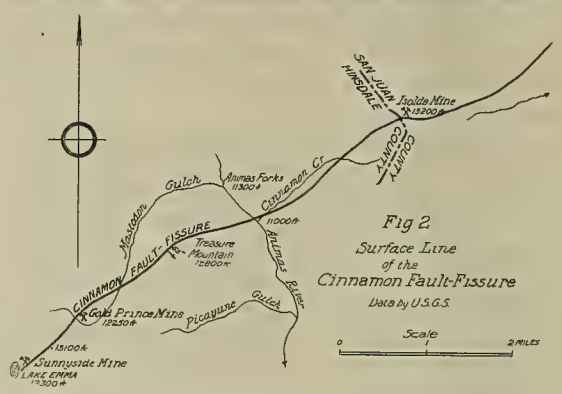


Fig 2
Surface Line of the Cinnamon Fault-Fissure
Data by U.S.G.S.

a large development of it is regarded as favorable, as one of the peculiar shoots of rich gold ore characterizing the Sunnyside vein generally occurs adjacent to it. The prevalence of large masses of manganese oxide which characterizes many gold veins, is curiously not a marked feature in those above mentioned. Rhodochrosite forming the matrix of dendritic gold threads is a feature of an exceedingly rich and small vein of Treasure mountain known as the Golden Fleece. Rhodonite itself forms a prominent constituent of the ore of the Camp Bird vein, seven miles to the west of Treasure mountain.

A remarkable feature of the great Treasure Mtn. veins is that below the horizon of the andesite, in the latite and rhyolite underlying, they are represented by quartz seams so narrow that they are often difficult to discover. Vegetation and talus conceal the slopes of the mountain so that the actual horizon where the veins pass into the underlying rock is not visible. In the canyon of the Animas river, however, carved in the Eureka rhyolite, the important Atlantic vein is represented by little more than a fracture plane. Still farther northeast, where it again enters andesite, it becomes in Cinnamon gulch a wide and ore-bearing vein.

No hypothesis which assumes the indiscriminate replacement of country rock by the quartz and gangue material appears to be acceptable to account for the Treasure Mtn. veins. All their characteristics in the andesite, clean-cut fissures, banded and vug structure, sharp contact with the walls, imply a subsequent filling of previously open space. Yet to imagine that fissures, or rather chasms, from 50 to 200 ft. wide, remained open a sufficient length of time to be filled slowly by deposition from heated solutions appears absurd. A median theory to account for their occurrence is probably the most reasonable.

In the first place, the difference of resistance

offered by the pyroxene andesite and the more silicious underlying lavas to the original fracturing force cannot be too strongly insisted on. I have previously described the manifestation of this in the case of the Tomboy and other lodes of Savage basin. On Treasure mountain the justice of this conclusion appears to have a spectacular confirmation. The same fissures which in the rhyolite originally existed as mere planes of slipping, were in all probability wide zones of finely comminuted rock between well defined bordering walls. Malcolm Maclaren tells me in conversation that he has observed cases susceptible of this explanation in New Zealand, where lodes traverse a series of andesites and rhyolites.

Granting that zones of comminution, the result of shattering along fault-planes, and varying from 50 to 200 ft. in width, were produced, it is not difficult to conceive that silicification of the comminuted material followed. Ore-bearing solutions which deposited the gangue minerals and metallic sulphides of the veins evidently did not penetrate the walls outside of the fracture-zones to an appreciable extent. On the other hand, they did succeed in changing the entire previously shattered mass, within well-defined limits and for considerable linear distances, into bodies having every appearance of regular ore-bearing veins. As to the vents or conduits through which the enormous quantity of gangue-material now occupying Treasure mountain reached its present horizon, there are only two possible explanations. One is that the responsible solutions ascended from their source through the narrow and almost imperceptible continuation of the veins in the underlying rhyolite; another is that certain fissures of a width about the same as that of the veins, and now plugged with dikes of white glassy rhyolite, were the original channels of the ore and gangue-charged solutions. A dike of this nature about 75 ft. wide is traceable for 500 ft. along the crest of Treasure mountain. It crosses the course of the Pacific, one of the large veins referred to, although at the place of intersection the relation of the two bodies is uncertain. If, as seems probable from the outcrop phenomena, the Pacific vein cuts the dike, it abruptly changes in this crossing from a width of 50 ft. to a mere series of stringers. On either side of the dike the vein assumes its normal width.

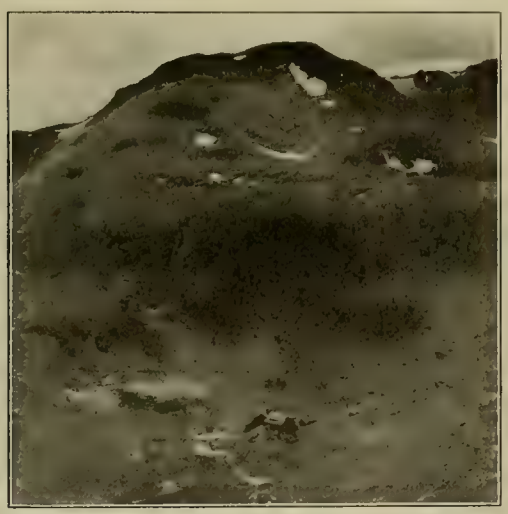


Fig. 3. Looking Southwest From Treasure Mtn. Over the Gold Prince and Sunnyside Extension.

Geological literature furnishes few descriptions of vein-quartz bodies comparable in their characteristics to those above described. So sudden a change of width when the veins pass from moderately silicious volcanic rocks into those slightly more acidic is a feature well worth the attention of geologists interested in the causes and manifestation of rock-fracturing. With reference to the San Juan region in general, it is the rule that veins of workable width in the andesite are greatly reduced in size when they pass either above or below into rocks of rhyolitic or trachytic habit. Therefore, the distinction between the component members of the volcanic series, especially in the Silverton district, should be well recognized before extensive mining development on any given vein is undertaken.

Fig. 4. Outcrop of the Great Eastern Vein at 12,800 Ft. Altitude.

Borax.—According to the Sydney *Morning Herald*: "There is a strange mountain in the Death Valley region of Nevada. It is known as Mount Blanc, and consists entirely of borax. Mount Blanc is approximately 1500 ft. high, and two miles in diameter. Frank M. Smith of Oakland owns the mountain absolutely, and thereby is said to control the visible supply of borax in the world. The market value of this borax where it lies is something more than £20 per ton. Experts estimate that the mountain has at least 3,000,000,000 tons of borax in it." This is among the things to be labeled "important if true." It reminds us of the discovery of a deposit of soapstone in Utah; it was assumed that soapstone was a substitute for soap, and in consequence the hope was held out of washing the blot (which, was not specified) from off the escutcheon of the State, adding thereto the motto: "While there is life, there is soap."

The strongest timber from a long-leaf yellow pine tree comes from the lower 20 to 30 ft. At 70 ft. the decrease in strength may be as much as 60 per cent.

SMOKE IN SMELTING WORKS.

Written for the MINING AND SCIENTIFIC PRESS
By E. H. MESSITER.

Fumes of sulphur, lead, arsenic, and other substances in the air in such quantities as to be disagreeable or harmful, or both, are frequently found in copper and lead smelting works. This condition is extremely undesirable and is often avoidable. It would seem that a more complete realization of the opposite condition is to come from more thorough study of the subject rather than from any material increase in the elaborateness or costliness of the arrangements used to handle the smoke.

Misplaced smoke may first be divided into three classes with reference to its sources:

1. Smoke issuing from a furnace or flue elsewhere than from its proper outlet during normal operation.

2. Smoke issuing through temporary openings made for charging, barring, rabbling, and so forth.

3. Smoke given off by molten or heated materials when drawn from the furnace.

The cause of the first class of smoke is generally insufficient draft; except in cases in which the volume of the smoke is unnecessarily increased by air introduced through openings in the furnace, and those cases in which parts of the furnace or flue where the gasses are under pressure are not gas-tight.

Insufficient draft is due either to lack of capacity in the chimney, fan, or blower, or to the existence of defects in the smoke-duct. The latter cause is much more complex than the former and is, perhaps, the commonest cause of insufficient draft.

Some defects frequently seen in flues will be mentioned below. All of them are more or less obvious, but they seem to occur often enough to warrant discussion. In many cases, of course, their presence does not indicate any lack of thought on the part of the constructor, but rather inability from force of circumstances to do anything better.

1. Insufficient area; (a) temporary, due to presence of flue-dust or other obstruction; (b) permanent, due to smallness of flue, resulting in loss of draft from excessive friction.

2. Square bends or bends of insufficient radius, including T instead of Y connections.

3. Sudden changes of cross-section. A fluid stream will not suddenly change its area of cross-section, and hence its velocity, without loss of head. In passing abruptly from a smaller to a larger duct the stream will generally refuse to change its cross-sectional area at all except at a considerable distance from the end of the smaller duct. Large chambers are frequently placed in the line of a flue for the purpose of depositing dust. The gases will ordinarily select a path through such a chamber and pass through with but slightly diminished velocity, simply making eddies in the remaining space and depositing there part of the dust. The power consumed by these eddies reduces the draft, while the fast moving central stream carries onward much of the dust that it was desired to deposit in the dust-chamber. Several engineers have suggested that the approaches to these chambers should be tapered. If so made, the deposition of flue-dust could not fail to be much more complete and the loss of draft greatly reduced. The dust-collecting capacity of a given length of the chamber proper would be so increased that for an equal result, the total cost of the chamber would generally be reduced. Arrangements for arresting fume, such as Freudenberg plates, bag-houses, and so forth, of course, reduce the draft by interposing friction, but the amount of such friction can be provided for in the design of chimney or fan.

4. Leakage in flues between the furnaces and the chimney or fan often introduces an amount of air that uses up an important part of the draft-producing capacity. Leakage beyond a fan as, for instance, between fan and bag-house, does not reduce the draft, but liberates gases at the ground-level, and this may be objectionable. Additional data on rates of leakage through flue-walls of different construction are much to be desired. More extensive use of the convenient bent-tube and water-gauge method of velocity-measurement instead of the anemometer will probably be conducive to an increase of accurate knowledge of this subject.

5. Incorrect arrangements of siphons. A siphon is here regarded as any elevation or depression of the flue above or below its general level. Under certain circumstances the introduction of siphons may have a dominant bearing on the success or failure of the flue. It must be remembered that from the moment the smoke leaves the furnace it is continually cooling and therefore increasing in density. In any siphon it is evident that the density of the gases in the first leg will be less than in the second. In an elevated siphon, that is, one in which the gases in the first leg are ascending, the smoke will therefore tend to pull itself over the summit. If the effect of the difference in temperature is more than sufficient to offset the friction, the smoke when once set in motion will flow through such a siphon without any other motive power. For an exactly similar reason, a depressed siphon (one in which the gases descend in the first leg) reduces the draft. If there is a considerable length of horizontal flue between the two legs or if the second leg is but slightly inclined and therefore relatively long, it is evident that the difference between the average temperatures in the two legs will be increased and the accelerating or retarding force of the siphon will be correspondingly augmented. The writer has seen a good chimney draft annihilated by a depressed siphon of this kind.

Passing now to the second class of troublesome smoke, that which escapes from temporary working-openings in the furnace, it is clear that effective methods of handling the first class will reduce or avoid the second. Such part of it, however, as may still escape needs to be treated along the same general lines as smoke of the third class, namely, that which arises from the hot solids and liquids discharged from the furnace. We can thus make a simple classification based on the method of handling rather than on the origin of the smoke.

1. Smoke that can be confined within the furnace and flue.

2. Smoke that escapes into the outer air.

The latter remains to be discussed. In considering ways of handling the escaping smoke it will be well to keep in mind the analogy that exists between the behavior of smoke in air and the behavior of syrup in water. When not greatly diluted, smoke can be mechanically removed from the surrounding air, but when dissolved in air smoke cannot be separated by any strictly mechanical means. Thick smoke has a measure of attraction between its molecules such that if we get hold of and move part of it the rest will tend to come along. It is 'stringy.'

The dilution of the smoke increases with its distance from its point of origin or with the time during which it is exposed to diffusion, and the difficulty of catching it increases in a tremendous ratio the farther away it gets. We must therefore dispose of the smoke soon after it escapes; we can then utilize its 'stringy' properties and also make use of its greater heat to create a draft to carry it away. This argues for small hoods close to the working-openings and the receptacles into which the hot products are drawn. The less air sucked in with the smoke the better. The places where these hoods are needed are the places where the workmen employ their tools. A little study will usually reveal a way in which a hood may be made, covering and enclosing the surface of hot material so as to catch the smoke and protect the workmen from radiated heat. Such a hood, outside of which the workman stands and not under it, will more often facilitate the use of his tools than interfere. A blast-furnace tapping-hood designed by me about ten years ago accomplished these objects.

It is not to be expected that these local smoke-catching devices will be absolutely perfect, but the quantity of smoke that escapes them can be made so small that the general ventilation of the building will be effective.

This last subject needs more careful attention than has heretofore been given to it. Many if not most efforts to ventilate smelter-buildings are frustrated when the wind blows, or at least when it blows from certain directions. Uncontrolled horizontal currents blow the smoke out of its proper channels and hopelessly mix the fresh incoming air with that which should be expelled from the building. Additional openings to let in more air often make matters worse. Ventilating monitors as usually built defeat their own object a considerable part of the time. Wind blowing into the monitor strikes the under side of the roof and swerving downward blows the smoke down to the working-floors. Instead of the customary blank openings or louvres, these monitors should in general be equipped with balanced swinging doors connected across a monitor by a rod or other device, so that when a door on one side is closed the one opposite will be open. They may be hung so that the wind will close the doors on the windward side. Air will then always leave the building through the monitor and never enter there.

Generally there should be at least one solid vertical side or partition in each direction to prevent the wind from sweeping through from side to side. In a few cases where there is much heat and little smoke and where men must work on different levels that cannot be separated by floors and independently ventilated, the wide open building may be better. But, as a rule, to compel the hot and foul air to go straight upward instead of sideways will give the best results. Plenty of fresh air is the desideratum, but when the air is not kept under control more air may mean less real ventilation. In the average smelting plant of today there is probably nothing more effective that can be done to improve the conditions under which the men work than to keep the smoke out of the air they breathe during their whole working time.

The ideas on the subject of smoke-handling here outlined were carried out in a smelting plant which I designed for the Federal Lead Co., near Alton, Illinois. This plant contains a number of Scotch-hearth furnaces and also blast-furnaces and hand-roasters. In the Scotch-hearth process as employed elsewhere the smoke was considered a serious handicap, affecting the health of the men and making it difficult to keep a proper working-force. The Alton plant in operation was free from smoke on all of the working-floors. In fact very little smoke could be detected anywhere in the buildings.

Ore in stock piles awaiting shipment is taxable as personal property, according to an opinion of the Attorney General of Minnesota.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

From C. E. K., Kennedy, Nevada: A gabbro with much titanite and ilmenite concentrated in nodules.

Received from R. M. B., Rollin, Siskiyou county, Cal.: No. 1, acid porphyry with some pyrite; No. 2, altered acid lava.

From D. D., Ely, Nevada: No. 1, black shale; No. 2, impure crystalline limestone; No. 3, molybdenite in granite; No. 4, malachite and chalcocite in quartz.

From C. G. G., Metcalf, Arizona: A substance of no specific name which supports combustion for a short time, distills crude oil and inflammable gas, and yields under the blow-pipe a light colored glassy slag; probably a highly bituminous shale.

From R. E. T., San Antonio, Texas: Specimens too small for precise judgment in doubtful cases; No. 1, crystalline limestone impure with pyrite; No. 2, highly altered acid lava charged with pyrite; No. 3, syenite; No. 4, acid lava almost completely changed to kaolin, silica, etc.; No. 5, crystalline limestone; No. 6, garnet; No. 7, altered syenite; No. 8, weathered granite (?); No. 9, biotite-hornblende diorite; No. 10, metamorphosed rhyolite; No. 11, feldspar from pegmatite; No. 12, hornblendic gabbro; No. 13, garnet-pyroxene hornfels; No. 14, fine-grained garnet-pyroxene hornfels; No. 15, hematite and magnetite; No. 16, hornblende andesite; No. 17, garnet; No. 18, biotitic gabbro (possibly a basic diorite).

VARIATIONS IN MINING COSTS.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

In our issue of January 4, 1908, Mr. J. R. Finlay contributed some thoughtful and suggestive observations on the estimated cost of mining as compared to the actual results obtained after years of operation. In other words, what is the true mining cost, to be taken by an engineer as a basis for estimates of future profit? In his article Mr. Finlay referred to the Bunker Hill & Sullivan, one of the largest, most productive, and best managed mines in North America. He gave some figures, based on the information then available, and pointed out that besides the operating cost of $2.60, there was $3,400,000 expended in betterments and other extraordinary expenses, so that the total cost (on a production of 3,388,108 tons in 20 years) was really $1 more than the operating cost. The $1 per ton represented expenditures such as no engineer could have foreseen and such as every engineer would have omitted 20 years ago in his appraisal of future profits. This presented an interesting feature of the problem.

By the courtesy of Mr. F. W. Bradley, the consulting engineer and president of the Bunker Hill & Sullivan Mining & Concentrating Co., we are enabled to present detailed data which in effect give the complete story of operations at this representative mine. The tabulated statement given herewith is well worthy of careful study. It represents a great deal of laborious compilation and covers operations for a period of 22 years—from May 1886 to April 1908. The average contents of the ore have varied astonishingly little—in itself the mark of profitable mining on a big scale. During the 22 years the silver assay has ranged from a maximum of 5.99 to a minimum of 4.61 oz. per ton, and during the same period the lead content of the ore has varied from 295 to 214 lb. per ton, that is, from 14.75% to 10.7%. Moreover, the ore in reserve appears to be of almost identical character, for it is estimated to contain an average of 4.82 oz. silver and 11% lead.

Next we come to the extraction. In the first 6 years, the yield was 92.9% of the lead and 99.5% of the silver, because a small tonnage (2326 tons per month) was mined, and the sorting, handling, and concentration were carried to a fine point. This supposition is confirmed by the relatively high operating cost, which was $4 per ton, as against $2.27 at the present time. Moreover the cost of shipping, smelting, and marketing (including loss in smelting) per ton of product shipped was than $42.69, as compared to $20.88 at the present time. In the next period, lasting 8 years, the extraction diminished so that it was only 80.7% of the lead and 71.9% of the silver. Apparently the first concentration mill had been enlarged, for the output increased to 11,627 tons per month, as against 2326 tons in the first six years. The operating cost dropped $1 per ton, and of this saving 27 cents was in the mill, for the cost of concentration had become 35 cents, as against 62 cents previously. General expenses also show even a bigger decrease, namely, 36 cents, as against over 94 cents heretofore. The total operating costs decreased $1 per ton in this second period, but even this was only a fraction of the economy introduced, for the retrenchment in betterments averaged $2.40, and the saving in shipping and smelting expenses no less than $5 per ton, so that the total costs were just one-half those of the first period.

The third period lasted seven years, and marked a further growth in the operations, for the average tonnage of ore mined increased to 23,835 per month, as compared to 11,627 and 2326 tons in the two preceding periods. The assay-value remained much the same, the lead declined from 11 to 10.86%, and the silver from 5.23 to 4.61 oz. per ton, but the recovery was improved to 89% and 80%, respectively, a gain of 9% in both metals. Meanwhile the market price of lead had declined from 4.33 to 3.65 cents per pound as between the first two periods, and it had recovered to an average of 4.61 cents during the third period. But silver had declined heavily, so that while the price stood at 97.37 cents per ounce in the first period, and at 66.54 cents in the second, it had dropped to 59.64c. in the third. Despite these fluctuations, the gross assay-value of the ore in the third period was $13.23, as against $11.67 in the second, and the profits won had been helped by a decrease in the tailing-loss, from $2.56 to $1.64 per ton. All the expenses incidental to the handling of the ore were diminished, so that the total operating cost was now $2.34, as against $3 in the period preceding. Betterments were less costly, so as to save an average of 50 cents per ton, but shipping and smelting had gone up to $5.47 from $3.99. This is largely accounted for by the less number of tons mined (5.11 as against 6.27) per ton of product shipped, and is also in part due to higher freight and treatment rates following the period of business depression (1892-1897), which was included within the second period. Owing to this last factor, the total cost was 21 cents higher than heretofore, but the better yield of the ore enabled a net profit to be won $3 higher than in the preceding period; the margin of profit was $4.10, as against $1.13 seven years earlier.

The fourth period brings the record to March of the current year, and covers only 10 months. The operations had been enlarged to an output of 27,222 tons per month, as compared to 23,835 in the preceding 7 years, and the discovery of large orebodies had placed the enterprise on a splendid footing. The assay-value of the ore was slightly better, but the tailing-loss was higher, because it had proved uneconomical to make a closer saving. Owing to the extension of the workings the cost of tramming is higher, but the large size of the orebodies has permitted of a lower mining cost. The total profit is $2.95, or $1.20 less, the decrease being due in large part to a falling off in "other earnings". A large profit, classed as "other earnings", was derived from the sale of the company's holdings in stock of the Tacoma Smelting Co., in the year 1905.

In summarizing the story of the mine it will be seen that an ore averaging $13.19 has yielded $11.06,

BUNKER HILL & SULLIVAN, WARDNER, IDAHO.

DATA PER TON OF ALL ORE MINED, BOTH SHIPPING AND CONCENTRATING.

	May, 1886, to May, 1892, inclusive. 6 yr. 1 mo.	June, 1892, to May, 1900, inclusive. 8 yr.	June, 1900, to May, 1907, inclusive. 7 yr.	June, 1907, to March, 1908, inclusive, 10 mo.	April, 1908. 1 mo.	May, 1886, to April, 1908, inclusive. 22 yr.	Future expectations.
Assay values { lead, lb	295.56	220.90	217.34	229.50	214.06	225.60	220.00
{ silver, oz	5.99	5.23	4.61	4.76	4.26	4.92	4.82
Recovered values { lead, lb	274.60	178.30	195.10	196.20	176.70	193.60	187.00
{ silver, oz	5.96	3.76	3.67	3.84	3.45	3.82	3.86
Average New York daily market prices { lead, dollars, per 100 lb	4.33	3.65	4.615	4.515	3.993	4.18	4.18
{ silver, cents, per oz	97.37	66.54	59.64	61.45	54.50	72.63	50.00
Average New York market prices when product sold { lead, dollars, per 100 lb	4 36	3.72	4.788	4.541	3.993	4.127	4.20
{ silver, cents, per oz	95.94	65.96	61.18	61.46	54.50	65.18	50.00
Gross assay value of ore, dollars	18.63	11.67	13.23	13.35	10.868	13.19	11.65
Tailing loss in concentrating, dollars	0.94	2.56	1.64	2.08	1.932	2.13	1.87
Net value of ore, dollars	17.69	9.11	11.59	11.27	8.936	11.06	9.78
Cost of mining, dollars	2.319	2.277	1.752	1.568	1.523	1.930	1.50
Cost of tramming, dollars	0.114	0.103	0.079	0 084	0.077	0.088	0.07
Cost of concentrating, dollars	0.623	0.351	0.252	0.423	0.372	0.315	0.35
Cost of general expenses, dollars	0.947	0.360	0.261	0.352	0.302	0.332	0.28
Total operating costs, dollars	4.003	3.091	2.344	2.427	2.274	2.665	2.20
Cost of betterments, etc., dollars	3.401	1.019	0.501	0.533	0.437	0.800	0.30
Cost of shipping, smelting, and marketing, dollars (including loss in smelting)	8.95	3.99	5.47	5.45	3.940	5.16	3.50
Total costs of every kind, dollars	16.354	8.100	8.315	8.410	6.651	8.625	6.00
Mining profit, dollars	1.336	1.01	3.275	2.86	2.285	2.435	3.78
Other earnings, dollars	none	0.124	0.831	0.090	0.043	0.509	0.04
Total profit, dollars	1.336	1.134	4.106	2.95	2.328	2.944	3.82
Dividends, dollars	0.884	0.672	3.929	4.518	2.377	2.804	3.00
Cash and cash assets, dollars	0.452	0.462	0.177	* 1.568	* 0.049	0.140	

MISCELLANEOUS DATA.

Shipping, smelting, and marketing, including loss in smelting, per ton of product shipped, dollars	42.69	25.02	27.95	23.05	20.88	27.40	19.25
Total tons of ore mined	169,752	1,116,212	2,002,146	272,220	31,550	3,591,880	
Average number of tons per month	2,326	11,627	23,835	27,222	31,550	13,606	40,000
Total tons of shipping ore and concentrate	35,616	177,930	391,953	64,409	5,950	675,858	
Average number of tons per month	488	1,853	4,666	6,441	5,950	2,560	7,273
Total contents of all product shipped { tons lead	23,310	99,538	195,378	26,712	2,788	347,726	
{ ounces silver	1,011,527	4,199,359	7,358,755	1,046,892	108,941	13,724,474	
Average output per month { tons lead	320	1,037	2,326	2,671	2,788	1,317	3,740
{ ounces silver	13,952	43,743	87,604	104,589	108,941	51,987	154,400
Number of tons of ore mined per one ton of product shipped	4.77	6.27	5.11	4.23	5.30	5.31	5.50
Value of silver recovered per pound of lead marketed, cents	2.083	1.391	1.150	1.203	1.064	1.286	1.032
Number of pounds of lead contained in ore per ounce of silver contained in ore	49.35	42.22	47.11	48.19	50.28	45.95	45.64
Number of pounds of lead recovered per ounce of silver recovered	46.07	47.42	53.16	51.09	51.22	50.68	48.45
Percentage of contents of both shipping and concentrating ore recovered for shipment { lead	92.89	81.16	89.87	81.16	82.44	85.81	85.00
{ silver	99.49	71.89	79.61	80.67	80.98	77.64	80.00

* Other resources than profit drawn upon in payment of dividend.

of which $2.94 was profit. This has been on a gross production of 3,591,880 tons mined in the 22 years. No less than 13,724,474 oz. silver and 347,726 tons of lead have been produced. Mr. Finlay's estimate of $1 for betterments would not be far wrong except that in this item is included large outlay in the acquisition of lands, aggregating about 3000 acres, which embraced a large number of mining claims, adding greatly to the available ore-resources of the company. Furthermore, a large proportion of the outgo charged as betterments consisted of expenses incident to litigation necessary to quiet title to important orebodies under the law of the apex. This might be a condition which any company would be obliged to confront, but in this case the circumstances were peculiarly fraught with legal difficulties which led to a long and bitter contest. The record shows that betterments averaged 80 cents per ton in the 22 years, ranging from a minimum of 43 cents to a maximum of $3.40 per ton. It remains to add that the estimate for the future is conservative, the ore being valued at $11.65, with a tailing-loss of $1.87, so that the net yield is expected to be $9.78 per ton. The period of construction is nearly over, for only 30 cents per ton is allowed for betterments, but the output is figured at 40,000 tons per month, so that any cost of improvements is distributed over a wide base. The entire record is most notable and is well worthy of close study, and should prompt the managers of other mines to contribute data of a similar kind.

Guanajuato produced from its mines ₱3,998,569, from September 1, 1907, to March 31, of this year, and there were expended ₱2,765,924 in development and equipment during the same period, according to a message of Gov. Obregon Gonzalez to the Guanajuato legislature. The ore milled amounted to 286,637 tons. There were 168 denouncements filed, covering 2585 pertenencias, or 6385 acres, of mineral land, and during the six months from September 1, 1907, to February 29, 1908, there were 111 denouncements filed, covering 1882 pertenencias, or 4649 acres. This shows a decrease in the number of denouncements, but is explained by the fact of the recent financial stringency. There were exported 19,662 tons of concentrate and ore, with a value of ₱1,560,057. The bullion produced from September 1, 1907, to March 31, 1908, by the different mills was as follows:

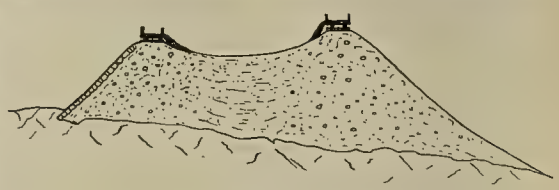
	Silver, kg.	Gold, kg.
Guanajuato Reduction & Mines Co.....	15,000	150
Guanajuato Amalgamated Gold Mines Co.	4,402	216
Peregrina Mining & Milling Co.....	4,480	307
Pinguico Mines Co.....	7,901	75
Mexican Mill. & Transportation Co.....	6,650	167
El Cubo Mining & Milling Co.....	715	9
Guanajuato Consolidated M. & M. Co.....	20,369	90
Total	59,512	1,014

Hawaiian coal imports, during 1907, from the United States amounted to only 5836 tons, as against 137,000 from Great Britain and her colonies. Of the latter, 116,000 tons came from Australia.

HYDRAULIC FILLING OF DAM.

Written for the MINING AND SCIENTIFIC PRESS
By DONALD F. CAMPBELL.

The building of a dam for a small reservoir of 2,000,000-gal. capacity was recently accomplished by the use of a small giant, fed by a 4-in. centrifugal pump. The water was available under a 40-ft. head, and by means of a direct-connected 30-hp. motor the pressure was increased to 45 lb. per sq. in. A No. 1 giant having 2 and 2½-in. nozzles was used, costing complete $70. The consumption of water was 425 gal. per min. The work was continued about 15½ hr. per day and was finished in 80 days with 5 to 7 men working with one team. The power used was 18,500 watts, and 3200 lb. of powder was



Dam Made With Aid of Hydraulic Giant.

necessary. The total cost of constructing the dam, which contained 7600 cu. yd., was $2600. The material washed down was selected from the reservoir site, so as to increase its capacity. The rock was a decomposed porphyry, in which holes could be bored by the giant, of sufficient depth to be used for blasting with black powder. The method adopted was as follows: Two flumes were built on the edges of the dam-site and the debris washed down and allowed to flow inward. In this way the gravel and sand were mixed, and the fine had a tendency to collect at the middle of the dam, while the coarse formed a good protection to the outside of the dam. The fill referred to was made exceptionally wide, so that the capacity of the reservoir could be increased at a later date. The resulting dam was well packed, and the natural deposition of the fine material in the centre, and coarser stuff on the outside only required a slight riprapping of rocks to complete an economic and efficient dam.

Tellurium is not fully oxidized to the di-oxide in the crucible assay of telluride ores, forming lead tellurate in the slag, as generally conceived, but is shown by Sydney W. Smith (*Bull.* Inst. Min. & Met.) to be decomposed at a red heat. He suggests that the reaction of litharge with tellurium is represented by the equation,

$$2PbO + Te = Pb_2O + TeO.$$

The return of tellurium to the lead button might then be represented by the reversal of this reaction at higher temperatures, since it has been shown that the reaction itself does not take place after silicates have been formed. The tellurium may be almost wholly removed from the lead button by 'soaking' it at a temperature of about 800°C. (a fairly bright red heat) in a pot or scorifier, for 30 minutes, covered with an ample amount of litharge. Mr. Smith has found differences in the gold obtained from 'soaked' and unsoaked buttons of more than 3 per cent.

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This view was taken during construction of the 100 STAMP DESERT MILL at Millers, Nevada. The ore bins and batteries are here shown; the bins being almost completed, while the mortars are just being set on the concrete battery blocks. In front of the stamps can be seen the Huntington Mills (used for regrinding) which are just being set.

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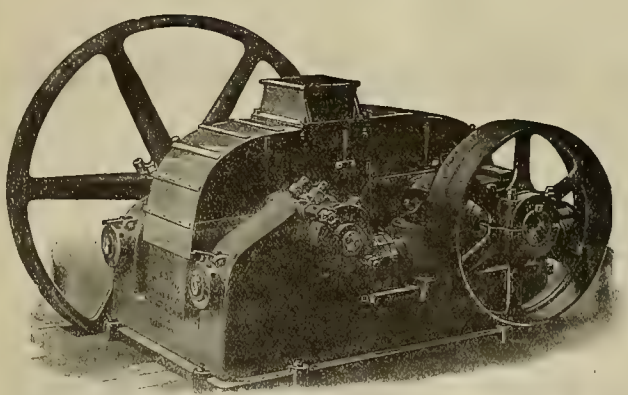

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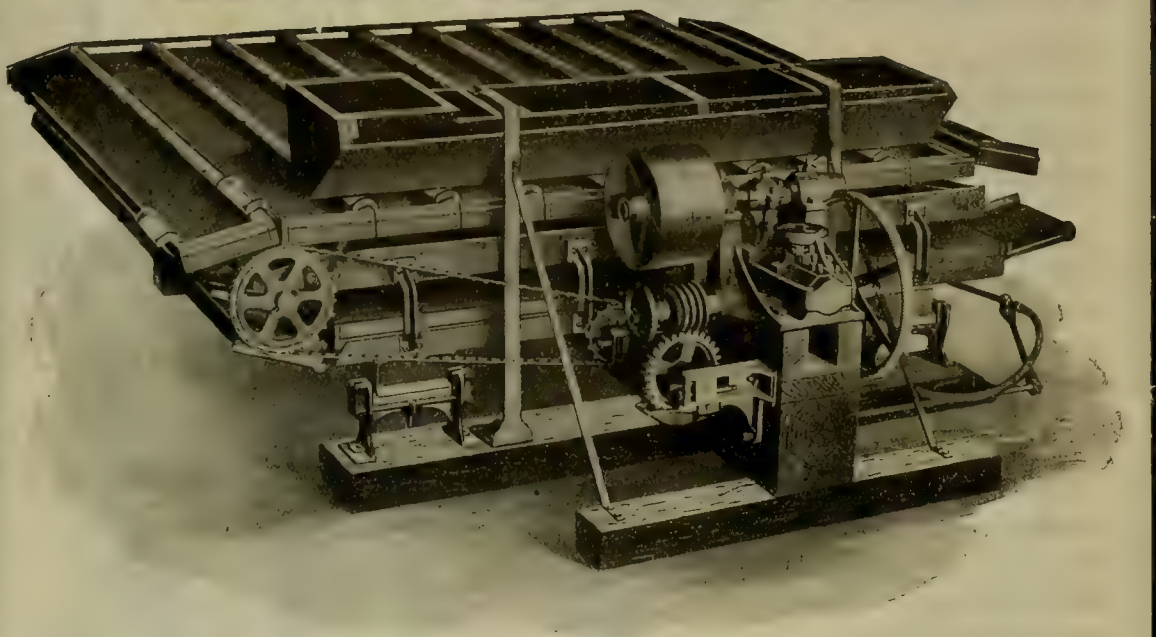

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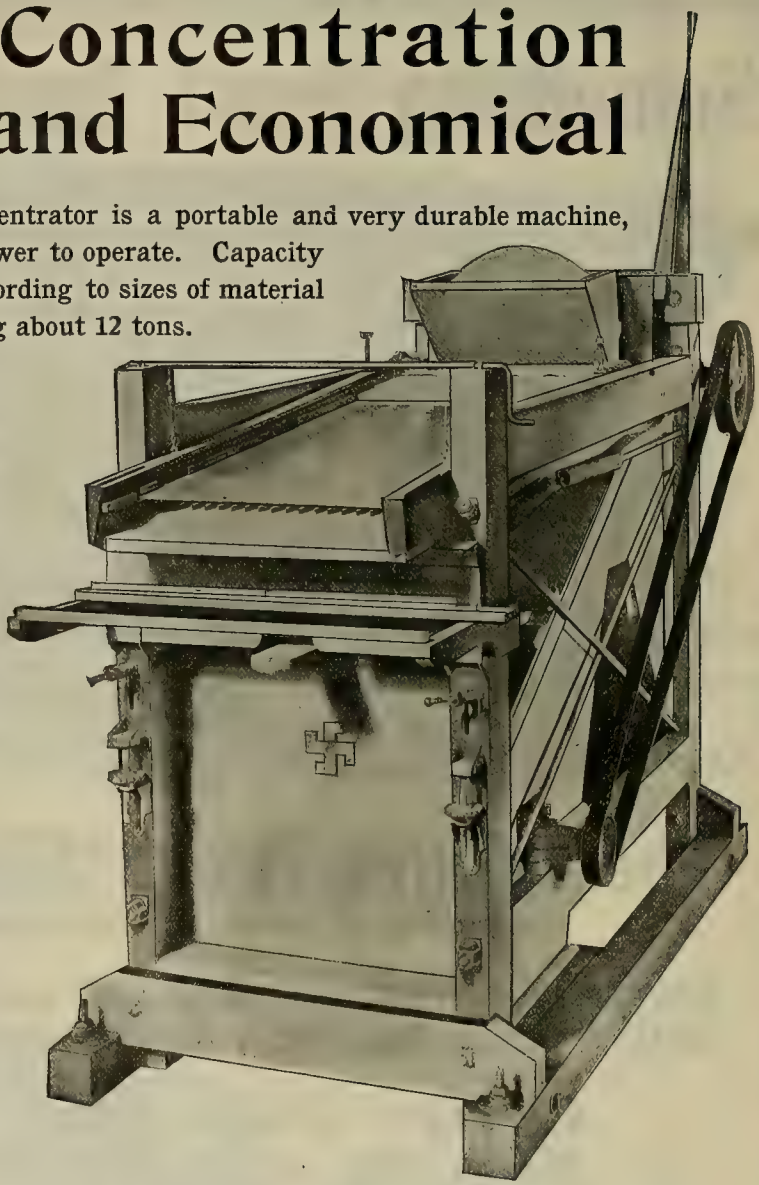

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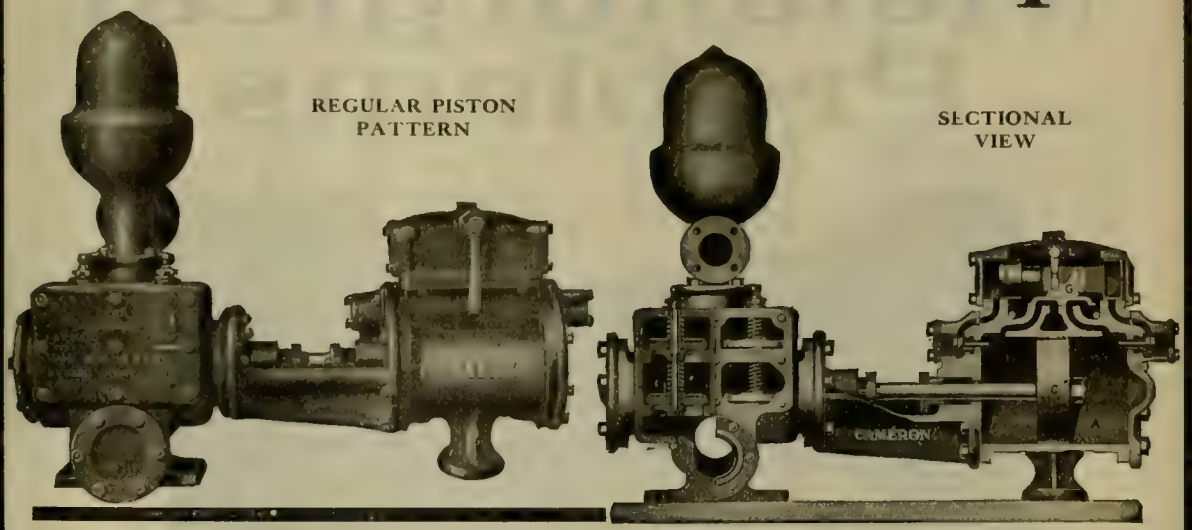

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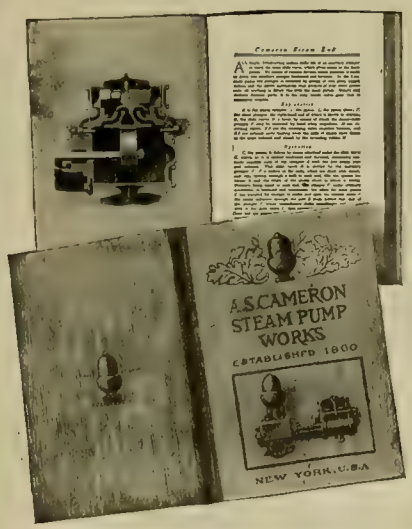

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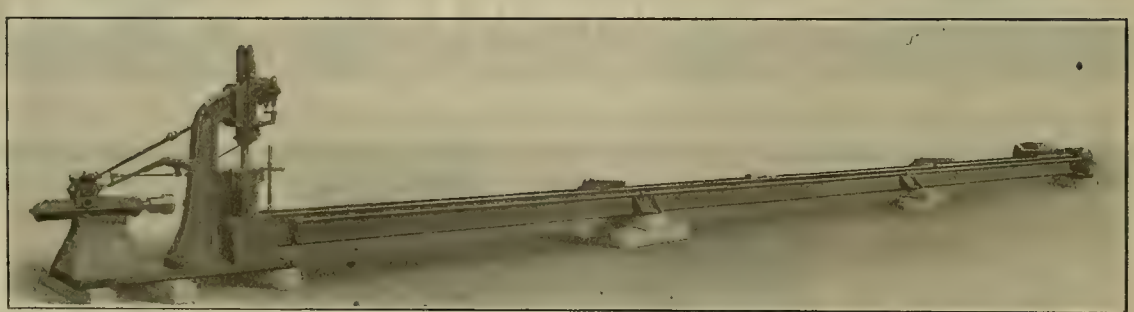

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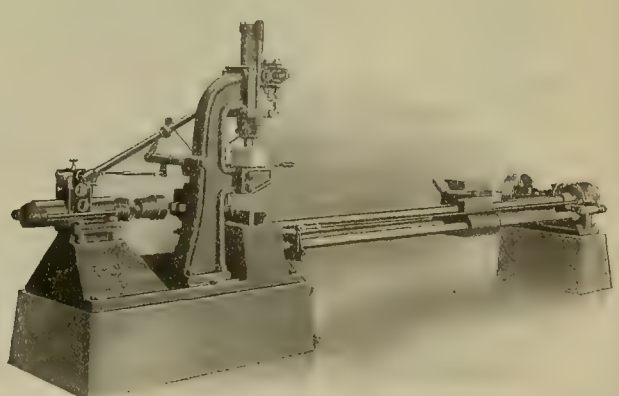

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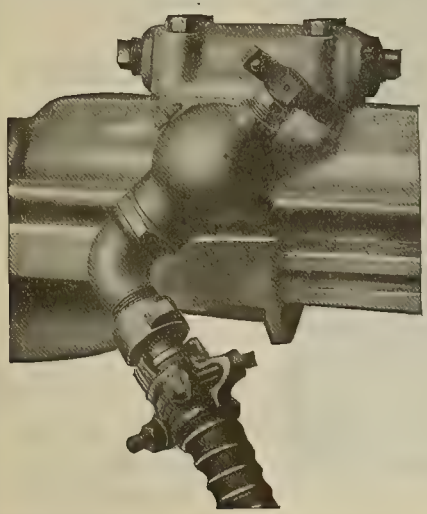

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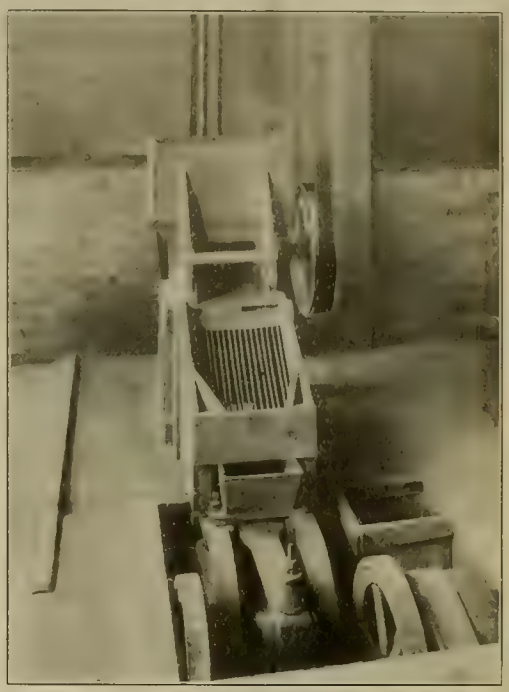

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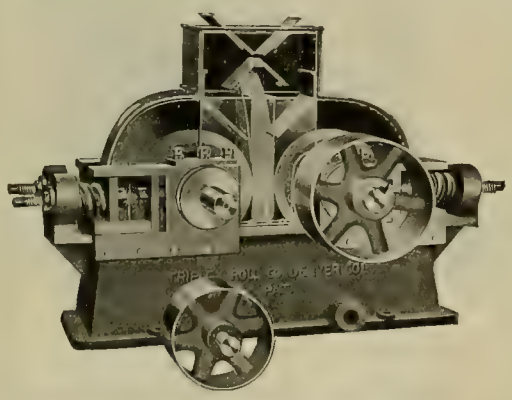

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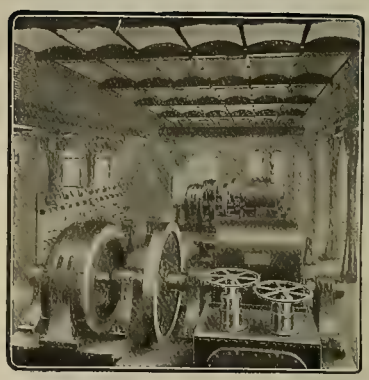

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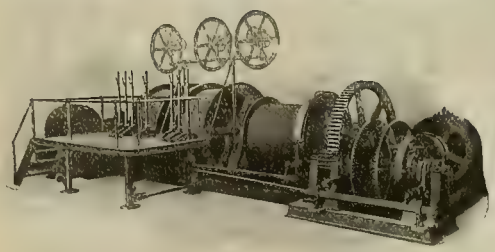

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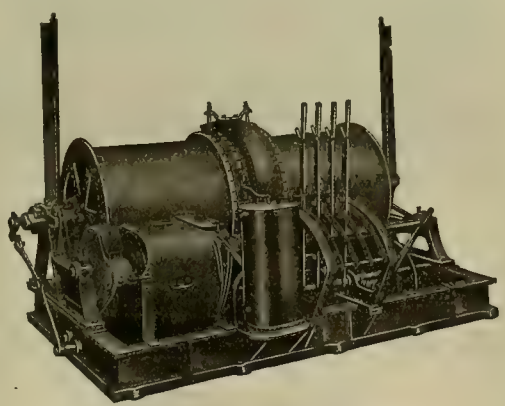

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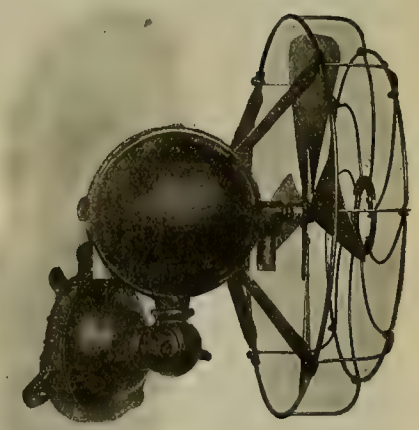

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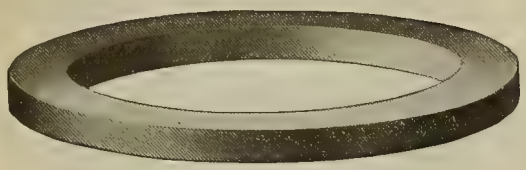

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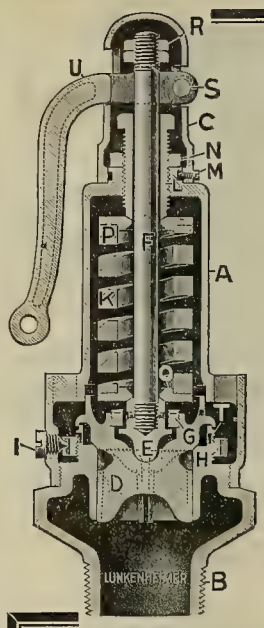

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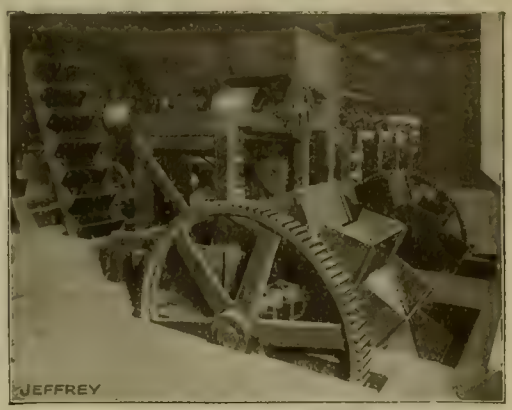

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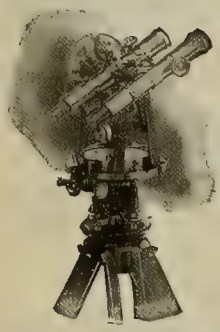

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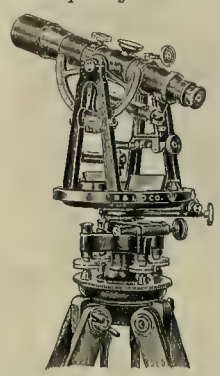

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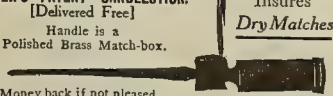

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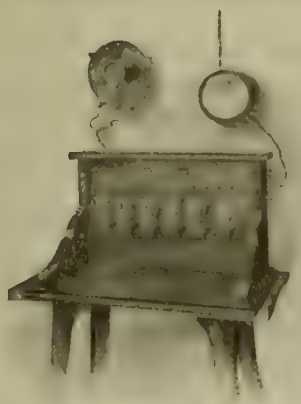

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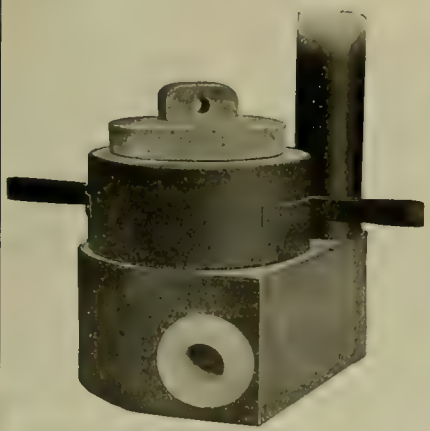

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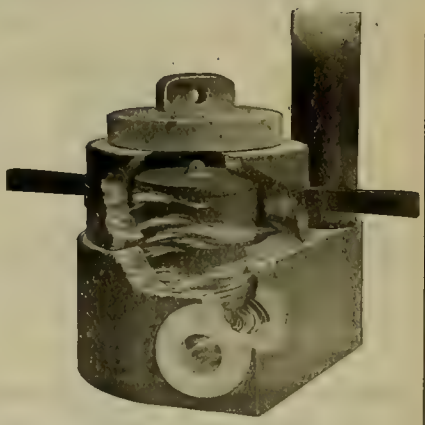

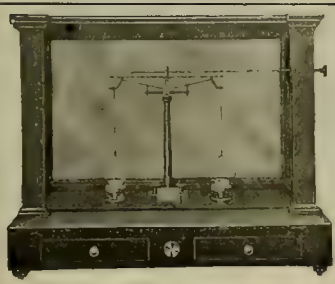

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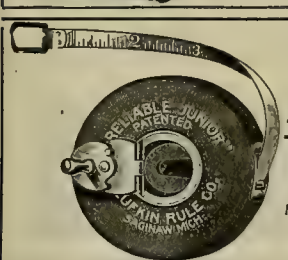

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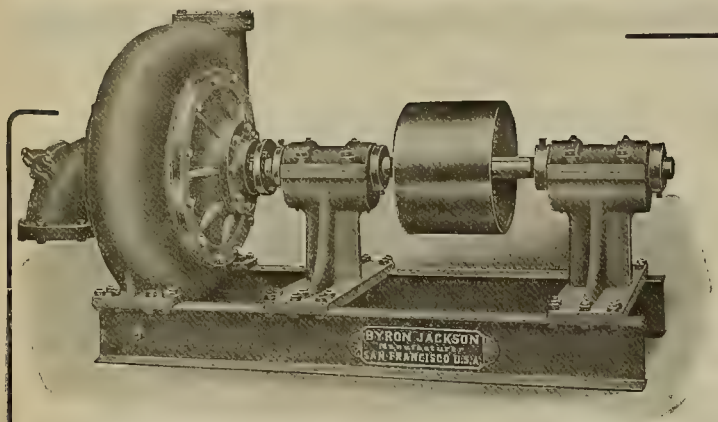

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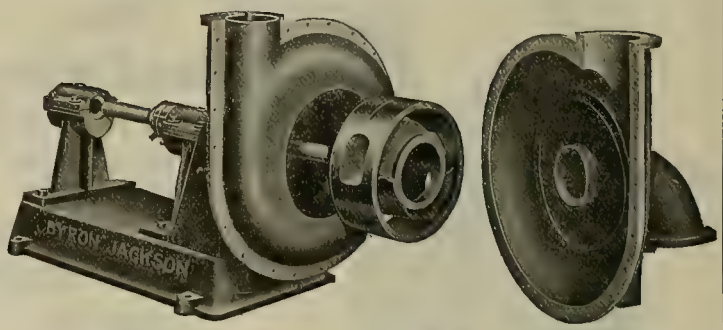

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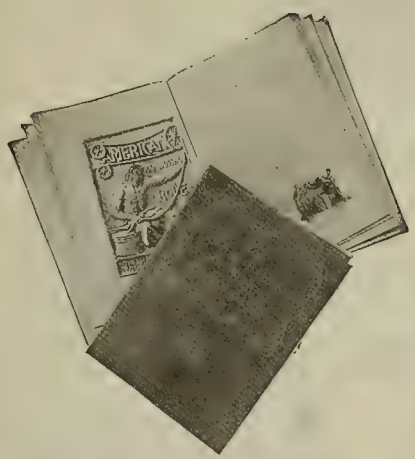

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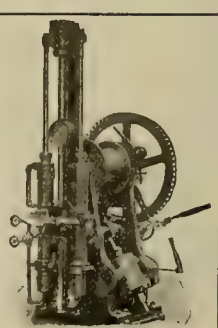

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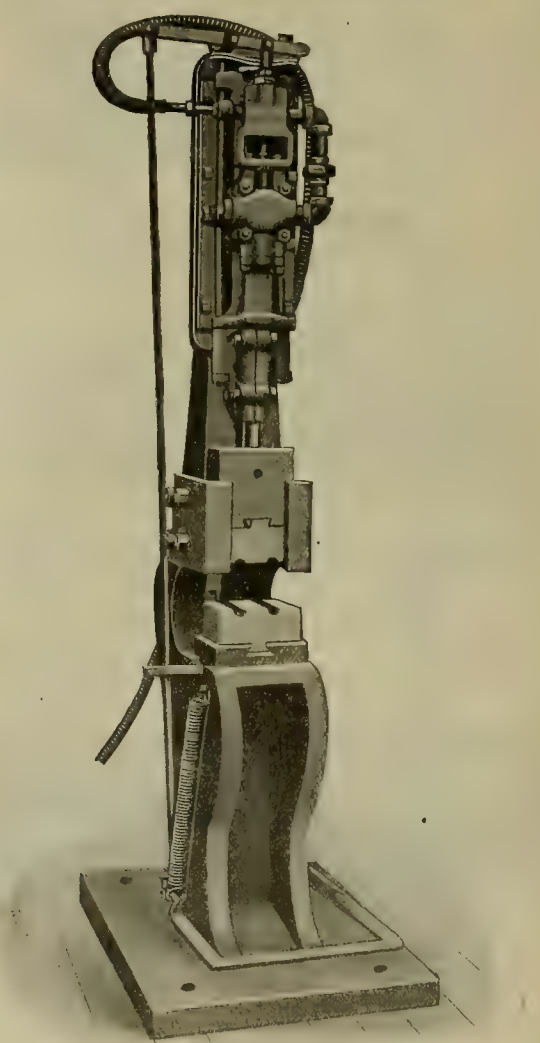

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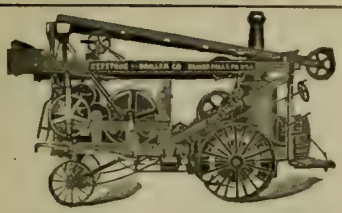

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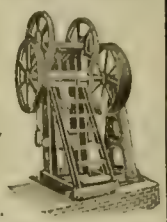

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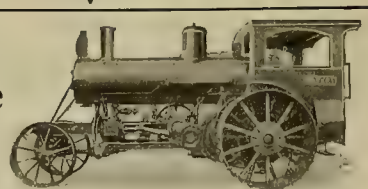

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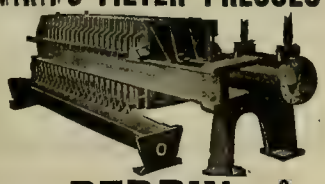

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NOTICES OF RECENT PATENTS.

Among the patents recently obtained Through Dewey, Strong & Co.'s Scientific Press United States and Foreign Patent Agency the following are worthy of special mention:

SPARK ARRESTER.—No. 890,993; June 16, 1908. F. R. Minkler, Fresno, California.

This invention relates to an apparatus which is designed as an attachment for the smoke-stacks or chimneys of boilers for engines, or like purposes, in which either an ordinary or a forced draft is employed, of such a nature as to tend to discharge sparks from the chimney. The spark-receiver may be designed as a cone or in other shape, as desired.

SYRINGE.—No. 890,990; June 16, 1908. A. E. Macdonald, San Francisco, California.

This invention consists in the combination of fluid-forcing means, a tube connecting therewith and having spray openings in its outer end, a valve in the outer end of the tube beneath said spray openings, said tube having a longitudinally extending return passage upon each side, and means forming a closure for said return passages and adapted to vary the inlet thereto, said means comprising a hood inclosing the tube and passages, and slidably mounted on said tube, and valve-controlled passages connecting the inner end of said return passages with the interior of the fluid-forcing means.

BUILDING MATERIALS.—No. 890,974; June 16, 1908. J. C. Fitzsimmons and J. V. Chown, Oakland, California.

The object of this invention is to provide a cheap, practical, fireproof slab, brick, or building block, which shall be very light, which shall have a surface suitable for receiving a finishing coat of plaster, or the like, which is especially applicable for molding into a plaster-board, and which can be nailed on to the studding like an ordinary board.

EXCAVATING AND LOADING DEVICE.—No. 890,954; June 16, 1908. E. F. Baldwin, San Francisco, California.

The object of this invention is to provide a simple, substantial apparatus for excavating and loading purposes, whereby the earth may be scooped up, elevated, and dumped into a bin or vehicle in one operation, and by a single scoop. The scraper-handle is to prevent premature dumping; as the scraper rises, the operator holds the rope tight to prevent its tipping forward.

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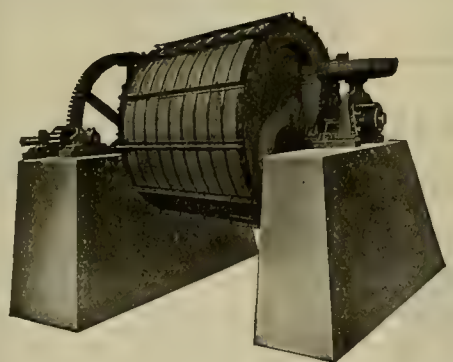

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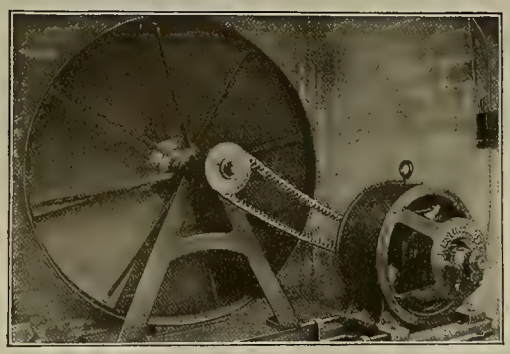

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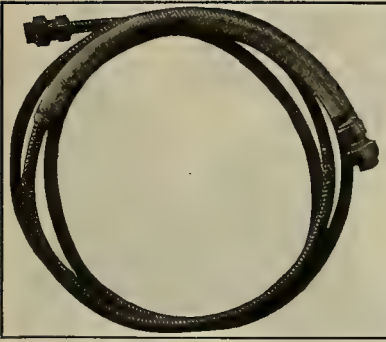

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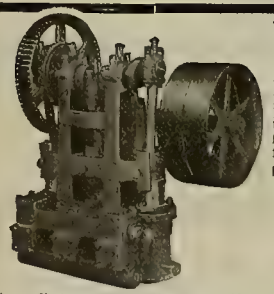

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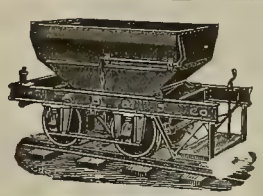

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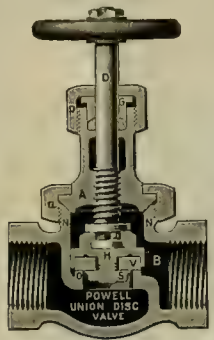

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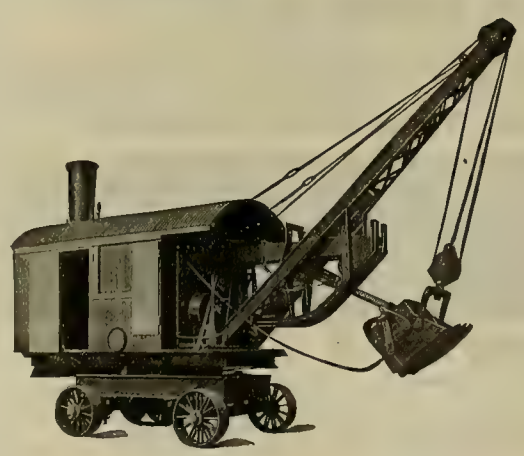

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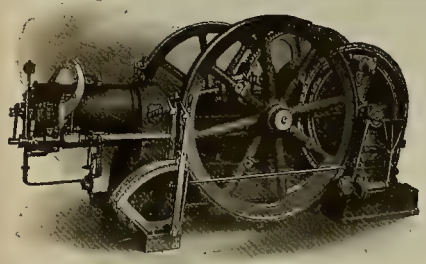

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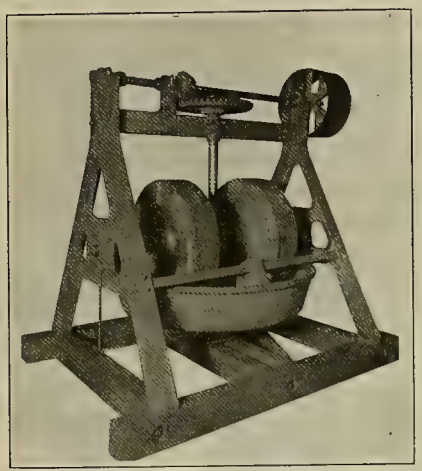

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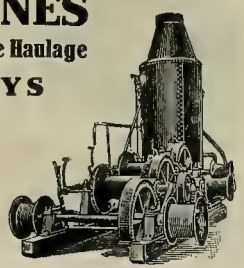

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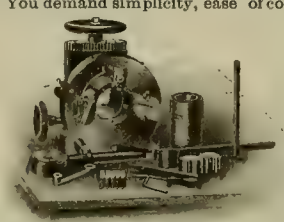

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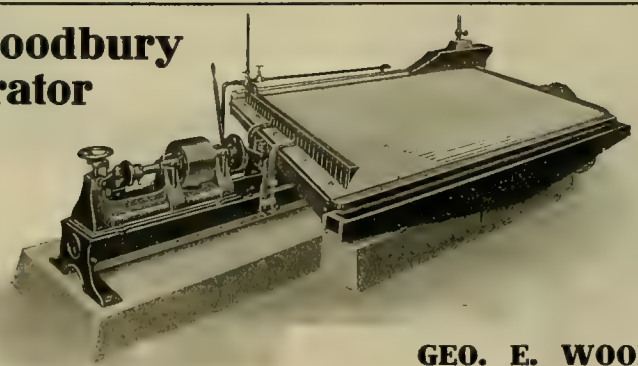

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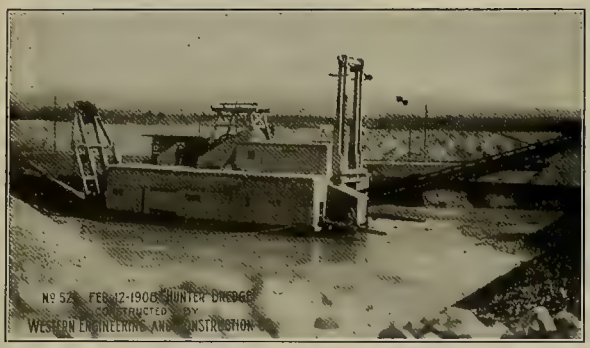

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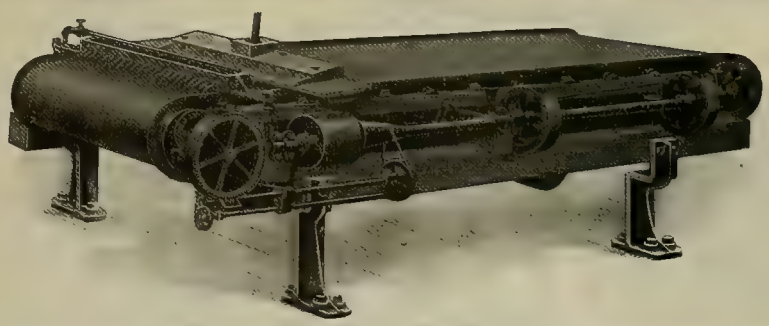

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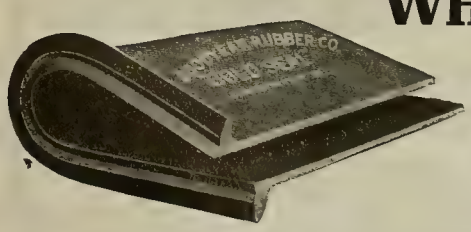

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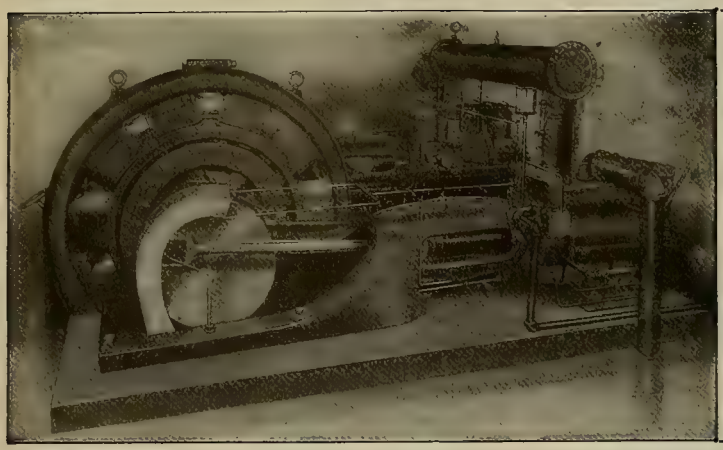

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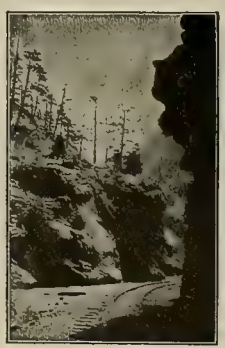

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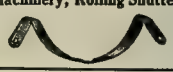

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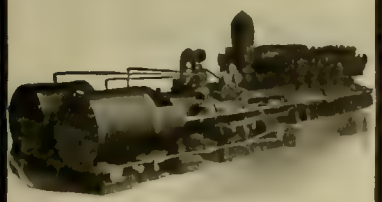

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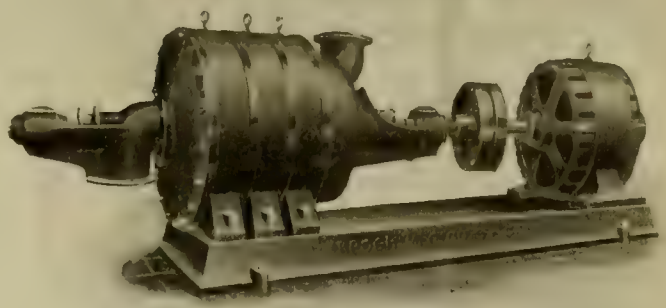

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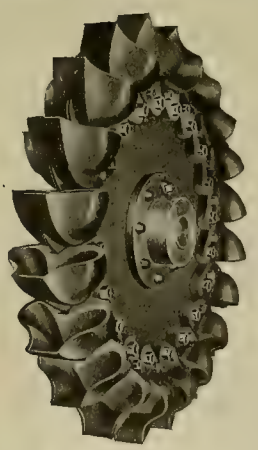

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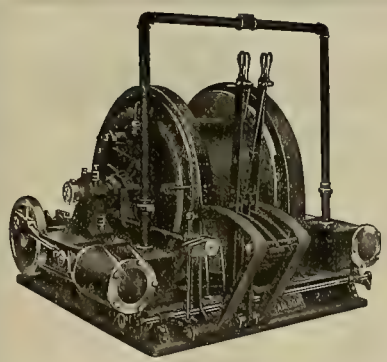

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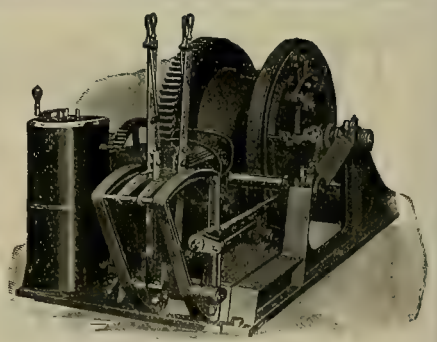

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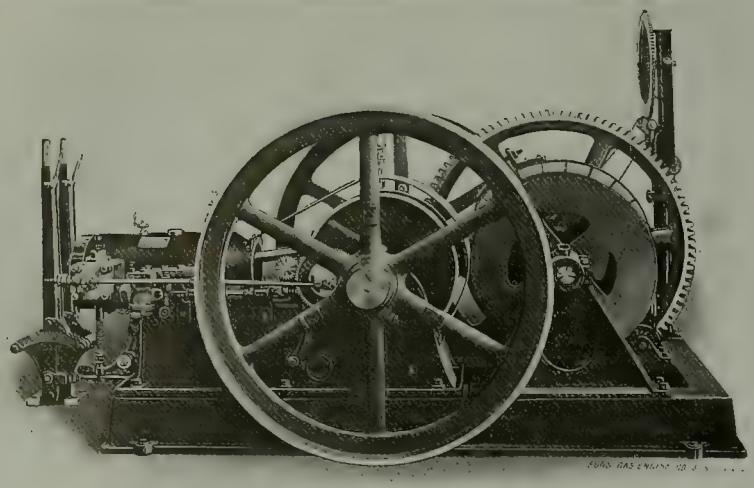

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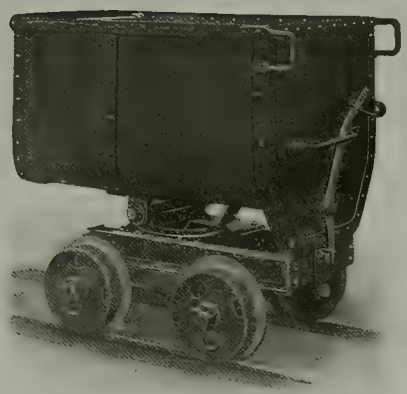

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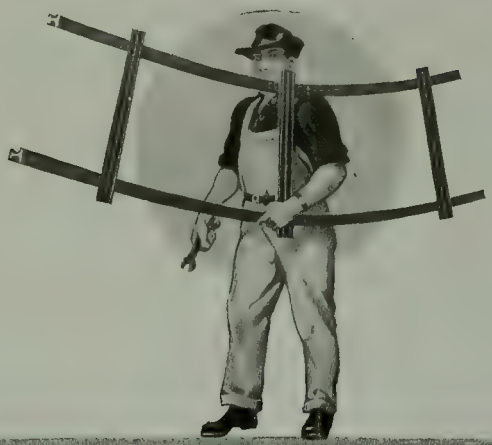

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Editorial.

WHILE you are standardizing, why not begin at the beginning and call it standardization, not standardisation, as is done by the Institution of Mining & Metallurgy. Most of us pronounce the s like the last letter of the alphabet in unconscious avoidance of excessive sibilants. American usage has adopted standardization; why not begin standardisation with standardization?

THE CALUMET & HECLA copper mine, in Michigan, was commonly supposed to have a life of thirty-five years before the dip of the conglomerate lode would pass beyond the side-lines of the property. The surprising statement is now made by the president of the company, Mr. Alexander Agassiz, in testimony given in the case of A. S. Bigelow *versus* Calumet & Hecla Mining Co., that the ore reserves will be exhausted in fifteen years. The testimony further revealed that the value of the surface equipment of this great mining company is not less than $15,000,000. The salvage on such of this as could be removed would amount to less than $4,000,000. The timber in the mines is estimated at over a billion feet, board measure, and the annual consumption is thirty million feet, equivalent to the stumpage of approximately 1500 acres of ordinary timber-land.

THE GREENE-CANANEA COPPER CO. has passed through so many vicissitudes of management, mis-management, and re-organization, so many things have been done that should not, and so many left undone that would have been a comfort to the stockholders if conscientiously carried out, that questions spring to the lips whenever announcement is made of new projects or contemplated campaigns. Recently a trial-run of the new installation was promised; now it is stated that two furnaces are being blown in as a preliminary step toward a general resumption of operations. One-fourth of the concentrator is running, the ore-beds are being filled, and a small output of ore is coming from the mine. The copper-market is certainly not an invitation to present production, but inactivity is detrimental to equipment, and to prestige. The most hopeful thing in the situation is that Mr. L. D. Ricketts stands for metallurgical and engineering competence of an order that will win success if able management can achieve it.

ATTENTION may fitly be drawn to the formation of a committee at Johannesburg with a view to co-operation in making experiments in connection with metallurgical improvement. According to our contemporary, *The South African Mining Journal*, this committee will represent eight of the principal groups and will consist of Messrs. E. J. Way, H. C.

Behr, W. A. Caldecott, A. M. Robeson, S. H. Pearce, W. Betty, E. H. Johnson, J. F. Cooke, A. Heyman, E. Farrar, C. B. Kingston, and W. L. Honnold. These are men known by honorable reputation elsewhere than on the Rand, and their co-operation should prove highly useful. The committee will also be prepared to examine appliances submitted by inventors and manufacturers. Eventually a central ore-testing plant and laboratory will be built, but at present the scheme is to avoid duplication of work and other unnecessary expenses incidental to the testing of processes and machinery, and the working out of metallurgical problems.

THE MINING SOCIETY of Nova Scotia is an organization that has labored faithfully in behalf of the maritime Province and deserves support from the people living in that portion of Canada. At a recent meeting Mr. E. Percy Brown read a paper entitled 'How can the gold industry of Nova Scotia be assisted?' He ended by suggesting "that Mr. E. R. Faribault be a member of this committee." As we happen to know how earnestly Mr. Faribault has worked in the elucidation of the geology of the gold mining districts of Nova Scotia, we are of the opinion that Mr. Brown's concluding remark is a logical reply to the question embodied in the title of his paper. But a postscript may be permitted. We hold that the recognition of facts and the publication of the truth is the best aid to legitimate mining, as also it is the most effective enemy of the illegitimate business done in the name of mining. Now, it happens that in 1905 the Government of Nova Scotia engaged a mining geologist, then residing at New York, to advise the Mining Department of the Province whether the local gold mining industry could be assisted and whether the evidence available warranted any effort to do so in a generous way. An investigation was made and a report was received in due time at Halifax. What has happened to that report? If it was a truthful statement, why was it not published; if unreliable, why was it not officially damned? Perhaps it contained some information useful to those engaged in digging for gold in Nova Scotia.

THE ANNOUNCEMENT that the Lucky Boy and Mountain King mines, in Esmeralda county, Nevada, have been acquired by the Chicago Exploration Company brings to mind the interesting circumstance of their discovery, in April of last year. These mines yield exceedingly rich argentiferous galena, with tetrahedrite and other copper minerals, in a silicious gangue. The vein occurs on the contact between an acid eruptive rock and limestone, along the side of a mountain seven miles southeast of Hawthorne on the stage-road to Bodie, California. As the road zig-zags up the slope it crosses the outcrop of the vein no less than four times. For forty years the wheels of stage coaches and freight teams have pulverized the ore and laid the outcrop bare, but no one stopped to examine it, nor take a sample for assay. It illustrates in a forcible manner the disregard of man for the things that are near and familiar. Prospectors brave Arctic rigors and tropic fever in the search for gold; they look out across the desert and plan adventures in the face of possible famine and thirst, filled with the hope of finding riches hidden in the mysterious distant solitudes, while their horses' hoofs are revealing treasures in the highway. For 350 years the *atajos* of the Mexican freighters between Vera Cruz and the City of Mexico crossed the protruding out-crop of a vein which made the fortune of an inquisitive American. It pays to be inquisitive, to sharpen the powers of observation, to test for oneself. But it requires more courage to do it than most men possess. Someone is sure to laugh, and the scoffer is more powerful than the man with a gun. These two human characteristics, disbelief in opportunity close at hand, and fear of becoming a butt of ridicule by inquiring curiously into familiar objects, keep more men from wealth than the terrors of the wilderness.

A Sign of Financial Vigor.

A trustworthy evidence of the restoration of normal financial health is found in the statement by the New York Clearing House that only about $8,000,000 remains unpaid out of the $35,000,000 advanced to crippled institutions in the metropolis by the associated banks and trust companies during the recent panic. The salvation of those institutions, which would have collapsed and pulled down others with them but for such timely and royal aid, illustrates the essential solidity of industry when the financial storm-cloud broke, in spite of a widespread mania for over-speculation. It indicates that no occult economic laws had been flagrantly violated, for which the world must pay heavy penalties, but that the weakness was a weakness of confidence, the proper antidote to which was safe-guarded extension of credit, on the homeopathic principle of like cures like. That the New York banks have rallied, while paying six per cent on these emergency loans, is a complete vindication of the soundness of the securities in which they had been dealing, which means that they represented transactions having a vital relation to commercial growth. In other words, liquidation was not necessary to realize upon the money-values represented by this paper. In addition to all this it is announced that the Clearing House has closed the account on its ledger headed, 'Amount procured for subscriptions to loans of associated trust companies.' This account represented contributions to the relief fund by institutions which were short of available cash, but which, being perfectly solvent, were able to pledge securities and utilize Clearing House certificates issued against them, in order to swell the amount required to tide over the weaker banks. On contributions provided in this manner interest at six per cent was charged by the Clearing House. The extinction of this account, taken in connection with the prompt recuperation of those institutions which for the moment were dependent on the bounty and mercy of their comrades, should certainly react as a tonic upon the financial faith of the country.

Selby Smelter-Smoke Trouble.

THE Selby Smelting & Lead Company has received an order from the Supervisors of Solano county, to discontinue the roasting of ore until such time as the Cottrell fume-precipitation plant has been successfully placed in operation, or until November, when the cessation of the trade-winds will relieve the town of Benicia from obnoxious smoke. This order, which has become immediately effective, would shortly result in the complete closure of the smelter but for the remarkable invention of Mr. Fred G. Cottrell, who is the Professor of Physical Chemistry in the University of California. This invention has so thoroughly demonstrated its practical efficiency as to lead to its adoption, and the installation should be in working order within two weeks if the necessary transformers for the electric current arrive in time. The Cottrell apparatus eliminates carbon, dust, and sulphur compounds, whether sulphurous acid or sulphuric anhydride. Thus it saves everything of value in the smoke and will prove a source of important profit.

The Selby smelter, accordingly, will not be likely to shut down, and the Company has officially announced that it will continue to receive shipments of ore, concentrate, and bullion without interruption. But for the timely completion of the Cottrell plant, however, enormous losses would have been entailed on mine-owners scattered throughout California and Nevada, as well as upon the Selby Company and its large force of employees. A remarkable feature of the situation is that the smelter, while occasionally responsible for causing discomfort to the citizens of Benicia, has been a less grievous sinner than a neighbor whose contributions to the sulphurous atmosphere in Carquinez Straits have escaped notice because of the prevalent fashion of regarding a smelter as necessarily a nuisance. Last week a useful article by Mr. E. H. Messiter on the detecting and mitigating of smelter-fume appeared in our columns. If the citizens had made actual tests, such as those there described, and had known at the same time what was going on at the Selby works, the order from the Supervisors would not have been issued. On Thursday, May 28, the Selby smelter, which is 29 miles from San Francisco, on San Pablo bay, was shut down; that is, the roasters and blast-furnaces were put out of operation, and remained idle for one whole week. Nevertheless, on Sunday, three days after the shut-down, the people of Benicia, just across the estuary, complained of the smoke from the smelter, and twenty-seven leading citizens made a formal protest. The fume annoying them manifestly came from the Union Oil Company's refinery. On passing the Selby works on the overland train a nasty smell should not be imputed to the smelter, but to the oil refinery, which is less than a mile to windward. Its unpleasant fume usually reaches the traveler just when he is close to the smelter. The incident affords a good example of the manner in which an unfair prejudice is created against the smelters through misconceptions for which some scientific men are partly to blame.

Lawson and the Guggenheims.

IT is apparently time to chronicle the passing of Lawson as a luminary from the skies of the mining world. Far from being a fixed star, it turns out that he has not even the cometary probability of returning to inflict the market with evil portent. He was only a rocket, making a vast preliminary noise before his flight, and tumbling back without even emitting a shower of colored fire. The Yukon Gold flotation was an absolute fiasco. Out of a total of 700,000 shares, only 350,000 were taken and paid for. This spells failure, and shows that the power of the financial acrobat of Boston to draw large and admiring audiences has definitely terminated. This leaves the Guggenheims with diminished prestige, and no compensating gain in ready cash. Instead of maintaining their former honorable course as leaders of productive enterprise, they chose to trade on their reputation. They must have been conscious that since the Nipissing affair even that asset had depreciated, else they could not have been driven to such an extreme as reliance on the broken reed of Lawson's popularity. It is persistently asserted by those who cannot be ignorant of the facts that Mr. Daniel Guggenheim himself sent for Lawson and proposed the Yukon flotation. Hence the stock was not underwritten, as would normally have been the case, and Lawson is under no obligation to take the remaining 350,000 shares. Moreover, the Copper Mines Company, which was to hold the Guggenheim interests in the Nevada Consolidated, Cumberland & Ely, Utah Copper, and other companies, will evidently not materialize. The Guggenheims are minority stockholders in all of these properties, hence, in order for Lawson to successfully complete a merger, it would require the assent of a large number of individuals who would hardly agree to the plan as now proposed. These minority stockholders represent larger interests than the Guggenheims, and they have already raised such violent opposition to the scheme as to render it quite impossible for Lawson, with any hope of financial success, to exercise his option on the stock which was to constitute the basis for the holding company, particularly in view of his discredited position after the collapse of the Yukon Gold flotation. Lawson has demonstrated his inability to longer sit in the game. A trickster may not hope to show his hand and then bluff the other players. His own egotism led him into self-betrayal, and the public, knowing the truth, can no longer give him the benefit of any doubt. As for the Guggenheims, they have sacrificed confidence and respect, but they are still powerful. Their future lies with themselves. Superstition that 'Guggenheim luck' would attend their ventures and make mines of prospect holes is not conducive to ultimate success. Attention to the mining features of their operations rather than to the stock market, reliance on the merits of the mines rather than upon the Guggenheim halo, a rigid rule separating the engineering staff from Wall Street, and a keener appreciation of the distinction between mine and thine, will possibly rehabilitate the tarnished name.

Personal.

F. L. Bosqui has gone to Los Angeles.

Frank H. Probert is at Globe, Arizona.

Foster Hewett is at Nevada City, California.

James W. Abbott is at Boston, Massachusetts.

George A. Packard is at Tangier, Nova Scotia.

Mark L. Requa has returned to San Francisco.

Howard D. Smith has gone to southern California.

Arthur L. Walker is in Idaho on professional business.

L. W. Trumbull is examining placer grounds in Montana.

J. Parke Channing is visiting the Miami mine at Globe, Arizona.

G. L. Guthrie has returned to Atchison, Kansas, from Costa Rica.

Daniel Duryea, of Joplin, is examining zinc properties in Arkansas.

Martin J. Heller has been in San Francisco, and is now at Globe, Arizona.

Juan Felix Brandes has gone to Sonora, Tuolumne county, California.

H. N. O. Spicer, of Denver, has just returned from a three months' trip in Mexico.

James P. Evans has become superintendent of the Colorado Iron Works, at Denver.

A. A. Adams, of Auckland, New Zealand, was in San Francisco on his way to Denver.

P. G. Lidner has gone to Cobalt, Canada, to examine mines at New Liskeard, near that camp.

Arthur Goodall, manager for the Fremont Con. M. Co., Drytown, California, is in San Francisco.

R. H. Channing, accompanied by Thomas Cox, has returned from New York to Cerro de Pasco, Peru.

S. F. Stoughton is general manager for the Stoughton Mining & Milling Co. at Breckenridge, Colorado.

H. B. Patton, of the Colorado School of Mines, has been in Black Hawk, Colorado, on professional business.

Bertram Hunt has gone to the Eagle-Shawmut mine, Tuolumne county, California, on a professional visit.

William A. Heywood, of London, is in Chile, where he is consulting metallurgist for the Copiapo Copper mines.

Frederick Lyon has been appointed assistant director of the United States Smelting, Refining & Milling Company.

C. Berthold Conlin has been examining mines in Chihuahua, Mexico, for the Packard Mining & Milling Company.

W. Murdoch Wiley has resigned as president and director of the San Gregorio Mining & Railway Co. of Guanajuato, Mexico.

Frank M. Estes, Jr., has returned to St. Louis from a two months' professional trip through Sinaloa and Chihuahua, Mexico.

R. B. McGinnis, mining engineer with the Chicago Exploitation Co., was in San Francisco this week on his way to Ludlow, California.

George W. Vivian has become superintendent of the mining and smelting operations of the Pittsburg & Montana Copper Co., at Butte, Montana.

S. F. Bretherton has just returned to San Francisco from a professional visit to the mines of the Great Western Gold Co., Ingot, Shasta county, California.

Thos. H. Mitchell, formerly manager for the American Smelting & Refining Co., at Santa Eulalia, Chihuahua, is now traveling mine superintendent in Mexico for that company.

Ralph Nichols has severed his connection with the Avino mines in Durango, Mexico, and has opened an office at Aurora, Illinois. He is at present engaged in professional work in Idaho.

Latest Market Reports.

LOCAL METAL PRICES—July 9.

Antimony	12@16c	Quicksilver (flask)	$45@45.50
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.85@ 5.80c	Tin	31¾@33¼c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
July 3	12.50	4.44	4.48	53¾
" 4	Legal Holiday. No Market.			
" 5	Sunday. No market.			
" 6	12.50	4.44	4.48	54
" 7	12.56	4.44	4.43	53¾
July 8	12.56	4.44	4.43	53¼
" 9	12.56	4.44	4.43	53½

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 2. £. s. d.	July 9. £. s. d.
Camp Bird	0 13 0	0 13 0
El Oro	1 6 9	1 6 3
Esperanza	1 10 0	1 14 0
Dolores	1 10 0	1 10 0
Oroville Dredging	0 10 7½	0 10 6
Stratton's Independence	0 1 6	0 1 6
Tomboy	1 11 9	1 7 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. July 2.	July 9.
Amalgamated Copper	66	70⅛
American Smelting & Refining Co.	76½	84⅝
Boston Copper	11	12⅛
Butte Coalition	22½	24
Cumberland Ely	7⅜	7¾
Dolores	6¾	6¾
El Rayo	21 5/16	11 5/16
Giroux	3¼	3¼
Greene-Cananea	10¼	10⅞
Indiana Sonora	4¾	4¾
La Rose	5 3/16	5¼
Miami Copper	7¼	7
Nevada Consolidated	11⅝	12⅜
Newhouse	5	5½
Nipissing	7	7¼
Ohio Copper	2⅛	2¼
Tennessee Copper	36¼	35¾
Utah Copper	33⅛	34¼
Yukon	3 7/16	3¾

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, July 9.

Atlanta	$ 17	Laguna	1.15
Belmont	85	Manhattan Con	9
Columbia Mtn	15	Midway	38
Combination Fraction	57	Montana Tonopah	1.35
Daisy	81	Nevada Hills	1.65
Fairview Eagle	45	Rawhide Queen	1.65
Florence	3.15	Sandstorm	28
Gold Bar (Bullfrog)	4	Silver Pick	17
Goldfield Con	5.77½	St. Ives	29
Gold Kewanas	32	Tonopah Extension	68
Great Bend	27	Tonopah of Nevada	8.00
Jim Butler	22	Tramp Con	18
Jumbo Extension	39	West End	60

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. July 9.		Closing prices. July 9.
Adventure	4⅛	Mass	5⅝
Ahmeek	70	Michigan	9½
Allouez	30	Mohawk	60½
Amalgamated	69¾	Nevada Con	12½
Arcadian	3⅜	North Butte	71¼
Atlantic	14¾	Old Dominion	36¾
Bingham Con	75	Osceola	102
Boston Con	12	Parrot	24¾
Butte Coalition	23⅞	Quincy	87
Calumet & Arizona	113¾	Rhode Island	3⅞
Calumet & Hecla	660	Santa Fe	1⅞
Centennial	26	Shannon	13⅞
Con. Mercur	39	Superior & Pittsburg	11⅝
Copper Range	74⅜	Tamarack	67½
Daly-West	10⅜	Trinity	13½
Franklin	9½	United Copper Con.	7¼
Granby	95	Victoria	5⅛
Greene-Cananea, ctf.	10⅞	Winona	6¼
Isle Royale	21⅜	Wolverine	133

General Mining News.

ARIZONA.

GILA COUNTY.

The Orphan Copper Co. has completed the wagon-road from Globe to its mining property and will at once commence moving the new machinery out. A force of men has been put at work cleaning out the Orphan shaft. When repairs are completed and the new hoists in place both shafts will be sunk to at least 500 ft. before any cross-cutting is done.

MARICOPA COUNTY.

The U. S. Surveyor General, at Phoenix, has announced that his charges incident to the survey of a group of claims has been reduced, and that $20,000 has been appropriated by Congress for use in survey and re-survey of public lands in the territory of Arizona. The latter item is of special significance to settlers who have been squatters on public land, because now they may have that land surveyed and obtain a title to their homestead.

MOHAVE COUNTY.

It is reported that the Holy Moses and the Santa Fe groups of claims, six miles south of Kingman, have been sold to a Los Angeles company, which will sink a shaft at once.——Work on the Expansion shaft has been suspended at a depth of 130 ft., because of the inflow of a large amount of water. This is not considered a calamity, but, on the contrary, is a good omen, in that an abundance of water is assured for the new milling plant which is soon to be erected on the property.

SANTA CRUZ COUNTY.

The Creston d'Oro mine, 15 miles southwest of Calabasas, has recently completed and started a 30-ton mill. The mine is controlled by an El Paso company called the Dawson Mining Co., of which O. B. Dawson is president. A force of 30 men is employed in the mine and mill.—— The Red Hill adit at the Four Metals mine, in the Mowry district, has recently cut an unexpected vein. When in 440 ft. a 14-ft. orebody, which gives fair assays in copper, silver, and lead was struck. The main vein will not be reached for at least 150 ft. more. The mine manager has asked the directors for an appropriation of $50,000 for the building of a 100-ton concentrating plant.——A new hoist has recently been put in place at the Red Cloud property, in the Harshaw district, and sinking will be commenced at once. The Red Cloud is under bond to C. H. Ferry, a New York man.

CALIFORNIA.

AMADOR COUNTY.

The directors of the Central Eureka mine, near Sutter Creek, have decided to re-open the mine. The shaft will be re-timbered and sunk deeper.

BUTTE COUNTY.

Graham & Braden report that they have found a rich gravel channel in the Sky High mine, near Oroville. They panned out $4000 in five days last week.

CALAVERAS COUNTY.

The Black Wonder quartz mine, situated on Blue Mtn., nine miles from West Point, re-opened last week after being closed for a year. Six men are now at work running an adit and a raise.——The Easy Bird mine-ditch is being cleaned out and other work done about the property preparatory to starting up the 10-stamp mill as soon as water can be obtained from the Mokelumne & Campo Seco canal.

PLUMAS COUNTY.

It is reported that F. J. Standart has sold three groups of claims, near Greenville, to A. J. McCone, representing a new company. The new owners will commence operations at once and may possibly erect a reduction plant.

SHASTA COUNTY.

James Sallee has purchased the Evening Star mine of Old Diggings, and will start work at once.——A recent fire in the assay office of the Kennett smelter did considerable damage and destroyed some valuable apparatus.

TRINITY COUNTY.

Skinner, Meckel & Fields, of Weaverville, have secured an option on the Mountain Boomer mine, in the New River district, and will start a small crew of men to work at once. The property is equipped with a three-stamp mill, a 3½-ft. Huntington mill, and a saw-mill.

NEVADA COUNTY.

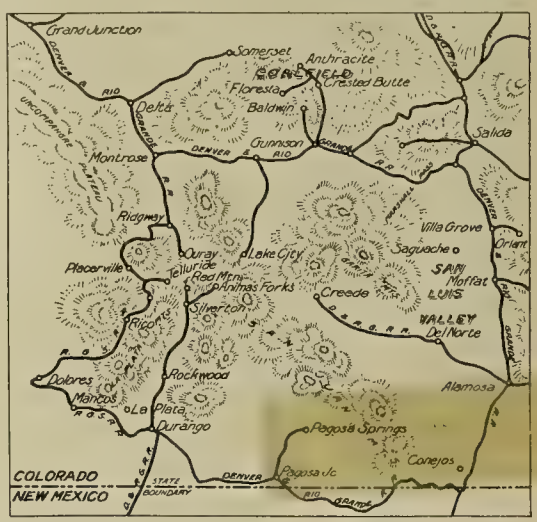
(Special Correspondence).—C. A. Mallen has resigned his position as superintendent of the Brunswick mine. A few men are still employed at the property pushing development work.——A rich strike is reported from the lower workings in the Empire mine. It is rumored that approximately $200,000 was taken out in a few hours with large quantities of the bonanza ore still in sight. A large force is employed and developments are being vigorously pushed. ——The working force at the Jenny Lind has been reduced. The gravel has not come up to expectations.——Lessees at the Mountaineer mine have leased the Sierra Queen mill to treat their ore.——The Anti-Debris people have been endeavoring to serve an injunction on Jerry Goodwin enjoining him from operating his hydraulic properties, but have thus far been unsuccessful, as Goodwin his eluded them at every point.——Lessees have secured choice blocks of ground at the Inkmarque and are in good ore.

Grass Valley, July 6.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Work will be resumed next week upon the Homestake group of claims, situated on



Map of Southwestern Colorado.

Lincoln Mtn. The adit, now in 150 ft., is to be driven steadily forward to intersect the series of veins ahead. This property is being financed by Georgetown business men, with Jos. Trudeau serving as manager.——It is stated that within the next two weeks work will be resumed upon the mines of the Democrat Mtn. Mining Co. It is believed that the Kelly adit, now in 2800 ft., is to be advanced an indefinite distance. A working fund of $60,000 has been provided. Work will also be carried forward through the Moline adit, the portal of which is 700 ft. farther up the hill. A raise will be carried from the Kelly adit to connect with the workings above. The 50-ton concentrator will be put into commission, the machinery to be fed upon ores from the Boston.——It is reported, but not officially, that the holdings of the Waldorf Con. M. Co., have been transferred under a 10-year lease to a syndicate of Kansas City, Mo., capitalists. The interested parties are said to own a large zinc smelter, and

after having made a number of tests upon the ores showing in the various parts of the Wilcox and Tobin adits, it has been found that the product is adapted to the method of treatment there installed. It is known that in one of the veins cut by the Wilcox adit, cadmium has been found which assays about 2%.——At the local sampler it is stated that more ore was delivered, during the month of June, than at any time since the panic of 1893. This is credited to the fact that a great many lesees are at work throughout the district. It is believed that the output will be doubled during the present month.——The Mollie Bawn mine on Covode Mtn. has been taken under bond and lease by H. C. Newton and H. C. Eckel, of Denver, who are now making a number of tests upon the ores, and as soon as the proper method of treatment has been decided, a small mill is to be constructed. The new firm has offices at the Cooper Bdg., Denver.——Davenport & Co., leasing on the 6th level of the Gold Dirt mine, started shipments of smelting ore this week, the product being sent to the Argo smelter, at Denver. A. Thoman, leasing on the same property, is sending out from one to two carloads of 6-oz. ore weekly, a force of 15 men being employed in the stope. ——The Elsie group of four claims on Alpine Mtn. has been sold to A. J. Windnagel, of Georgetown, who is now forming a company for the development of the property and expects to have work under way within 30 days. The consideration was not made public.——Work is to be resumed upon the Bernhardt group of claims, Green Lake Mtn. The adit, now in 250 ft., is to be driven ahead.——A 4-in. streak of high-grade ore has been struck on the hanging wall of the drift being run on the North Star vein, East Argentine. Tests made show values of 20 oz. gold and 9764 oz. silver per ton. The ground is now being opened to prove the extent of the discovery. M. Bonham of Georgetown is owner and operator.——The McClellan Mtn. M. & M. Co. has resumed work on company account, the contract held by W. M. Graves having been completed. A vein was reached a few days ago which shows scattered ore, but no driving has yet been done. It is believed that the vein is the Gold Coin, but until a survey is made, this will not be known for a certainty.——The La Moe adit of the Charter-Raton M. & M. Co. is being driven steadily forward, having reached the 1150-ft. mark. The heading is still in vein matter, but the hanging wall will probably be reached in a few days. This is believed to be the Charter vein, which on surface makes an excellent showing, a considerable amount of high-grade ore having been mined from the shaft workings.——Work is now under way upon the Drummond group of claims, Columbian Mtn. The machinery has been overhauled and placed in condition and the winze is being unwatered. This winze is to be sunk 75 ft. deeper, and the adit will be driven ahead. This property is held under bond and lease by the Golden Glory T. M. Co.——A number of stockholders from Chicago of the Georgetown T. Co. were in camp this week to decide upon plans for the work that is to be done in the future. They were accompanied by R. B. Sigafuss of Denver, inventor of the boring machine that bears his name. This machine, which is now in the process of manufacture at Milwaukee, Wis., is to be given the try-out at the Georgetown adit, the portal of which is situated on Columbian Mtn. Mr. Sigafuss expects to have the equipment in Georgetown some time during the present month. G. D. Parks of this place is manager of the company.

Georgetown, July 5.

DOLORES COUNTY.

The large boiler which was moved from the railroad switch at Coke Ovens, up on the Meadows, last fall will soon be taken to its destination at the Emma mine, where it will be put into service.——The Pro Patria mill of the United Rico Mines Co., which has been undergoing repairs for some time, was started last week and is now grinding steadily on ores from the Atlantic Cable mine.——Work was resumed during the first of the week on the Bluebell group, in Burnett gulch, the snow having melted away so that the adits are now accessible. Edward Baer & Sons, who own the property, contemplate doing considerable mining this summer both in Burnett gulch and in Silver Creek gulch, where they own the Fourth of July group of claims, on which a good grade of copper ore has been discovered.

LAKE COUNTY.

The Granite tunnel, which is being driven into Yankee Blade hill north of the town of Granite, is fast approaching the first known vein on its line. It is expected that this point will be reached some time during the next month. Some ore has already been removed from the property, but no shipments have been made.——The management of the new Garibaldi tunnel has decided to cut a station some distance from the portal, and install there the plant of machinery which is being secured. This will do away with the necessity of erecting additional surface buildings, and will in the end, it is claimed, be cheaper.

SUMMIT COUNTY.

The success by the new mill of the Blue Flag Co. has resulted in a determination to double its capacity. In addition to milling facilities a compressor and machine drills are being installed. The company has been making continuous shipments of high-grade concentrates for the last 10 months.

TELLER COUNTY.

The production of the mines in the Cripple Creek district for the month of June was 64,150 tons of a gross valuation of $1,302,530.——The Prince Albert Mining Co., of which H. H. Iland is the president, is engaged in installing a compressor and complete plant of machinery preparatory to driving the adit on the property. The bore will be driven a total distance of 1300 ft.——The Roosevelt deep drainage tunnel is now in a total distance of 2080 ft. Progress during June amounted to only 187 ft., due to extremely hard rock with the heading lately entered.——Richard Roeloff has taken a lease on the Lonaconing property, on the west slope of Beacon hill at Cripple Creek, and will install new machinery.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The principal feature of the past week in the Coeur d'Alene was the signing of a lease between Monarch Mining Co. and the Coeur d'Alene North Fork Mining Co. The lease covers the whole of the former company's property and is for a period of two years, embodying at the same time an option to purchase the property for a cash payment of $175,000 and 350,000 shares. One of the terms of the lease provides that the Coeur d'Alene North Fork company shall discharge an indebtedness incurred by the Monarch company since January last amounting to about $17,000. The leasing company agrees to expend not less than $10,000 in the development of the property during the remainder of this year and not less than $20,000 in 1909. The Monarch company is to get 10% of all returns on ore shipped, and in the event of the North Fork company exercising its option to purchase, the proceeds from the ore shipments are to be applied toward the cash payment. Development work on the property is not to cease for more than 60 days during any six months of the lease.——An investigation into the affairs of the Snow Storm mine, one of the big dividend payers of the Mullan district, is about to be demanded by the independent stockholders. It is claimed that since last March the mine has been shipping from 500 to 600 tons per day to the smelter. Even at the present state of the copper market it is estimated that the returns on this cannot be less than $6 per ton, which would make a daily profit of $3000. An attorney is to be appointed and a statement of the application of this money will be demanded.——An extraordinary statement has been issued by D. E. MacKinnon, the manager and promoter of the Amador mine, concerning which there was such a scandal. This statement forms a general denial of all charges made against MacKinnon and embodies in full a report of one

of the engineers who recently reported the property worthless. The report referred to is dated November, 1903, and is to the effect that there are enormous bodies of ore in the mine, concluding with a general defiance of contradiction and congratulations of those who hold stock. MacKinnon requests that Wallace men send him proxies, but since then another statement has been issued by the directors requesting that they be withheld.——A strike of good ore has at last been made in the Neversweat mining claim situated almost in the heart of the city of Burke. For more than 18 years John Mader has labored on this claim literally at the point of rifles. Time and time again has his title to the claim been disputed, actions have been fought out in every court, shooting scrapes have risen by the score, and not less than a month ago Mader was attacked by seven men armed with rifles. The whole trouble is due to surface rights wanted by certain of the townspeople for building and residence purposes and opposed by Mader. The strike on the claim is a good one and 2 ft. of carbonate ore has been opened at a depth of only 6 ft. This ore was uncovered while prospecting with the object of sinking a shaft, and has been traced for a distance of 22 ft., by means of open-cuts.——Wesley Everett, heaviest stockholder and manager of the Leslie and the Amazon-Dixie properties, makes the startling statement that the Leslie mine will be developed with a tunnel 2000 ft. in length at no expense whatever to the stockholders of that company. For more than eight years Mr. Everett has managed the Leslie property while the Amazon-Dixie company has recently been organized, and the proposition that Mr. Everett will make is to the effect that the Amazon-Dixie company will drive a tunnel 1000 ft. in length which will tap the ore-shoot at a depth of 800 ft., from which point driving will be commenced toward the Leslie ground, through which the Amazon-Dixie vein has been traced for a distance of 12,000 ft. or more. Between $18,000 and $20,000 worth of machinery will be installed by the Amazon-Dixie company at once The largest ore-shoot ever discovered on the surface of any mine in the Coeur d'Alene has been uncovered in the Amazon-Dixie property. It is 9 ft. in width and has been traced to a length of over 800 ft. A one-sixth interest has been sold to Herman J. Rossi of Wallace for $20,000.

Wallace, July 6.

IDAHO COUNTY.

(Special Correspondence).—The Idaho Mascot, a newly located group of claims near Elk City, has reported some high-grade free-milling gold ore in a short prospect adit. The vein has been recently found after a year's exploration induced by high-grade float found near the Del Rio property.——A strike of importance is reported from the Gold Crown mine near Elk City, where development is in progress on a short adit. The ore is free-milling with some tellurides.——The Crackerjack mine has been sold to M. J. Sweeney of Spokane for $8000. It is thought he may be representing Guggenheim interests, as it is known they have been looking into this district for some time.

MONTANA.

(Special Correspondence).—Because of floods, damage to the Great Falls smelter of the Amalgamated Copper Co., and washouts on railroads, the June copper production of the Butte district was less than 50% of the normal. All of the mines, with the exception of a few small ones, were closed entirely for 10 days, and some of the Boston & Montana mines were closed all month with the exception of two days. Two of the Boston & Montana properties were operated only 12 days. The Anaconda and St. Lawrence mines, the two largest producers of the Anaconda Copper Mining Co., were closed 10 days by the floods, and after re-opening and operating for a few days were forced to close again by a fresh outbreak of gases from the fire that has been burning above the 1100-ft. levels of those mines since 1889. June was a remarkably disastrous month for Butte mining. The estimated production for the month was 13,159,000 lb. from 150,350 tons of ore. The various companies contributed to this amount as follows:

Companies.	Ore, tons.	Copper, lb.
Boston & Montana	29,400	2,646,000
Anaconda	24,000	1,728,000
Butte & Boston	7,200	504,000
Washoe	6,600	462,000
Parrot	4,500	297,000
Trenton	6,000	390,000
North Butte	29,000	3,190,000
Butte Coalition	17,000	1,700,000
Original	22,000	1,870,000
Pittsburg & Montana	4,650	372,000
Totals	150,350	13,159,000

The Big Eight mine, at Troy, 18 miles west of Libby, has been sold to a French syndicate for $60,000. A saw-mill has been purchased and will be installed at once, after which extensive developments will be undertaken. A concentrator will be erected and it is expected that the mill will be running early in the coming winter. John Gordon, of Troy, is interested.

Butte, July 6.

NEVADA.

CHURCHILL COUNTY.

The Mizpah-Bretz lease at Fairview is putting in a 15-hp. hoist, head-frame, air compressor, machine drills, buckets, and 700 ft. of cable.

ESMERALDA COUNTY.

The Wisconsin mine, at Lida, will probably resume operations soon. A new hoist was put up and a shaft sunk last year.——The main shaft on the Goldfield Daisy Syndicate's property is being enlarged to three-compartments to a depth of 400 ft. Shipments from the property will be resumed at once.——A company has been incorporated to bore for oil in the vicinity of Alkali springs, between Goldfield and Lone Mtn. A rig is already on the ground. The 35-ton Hathaway mill for the Nevada Empress has arrived at Bonnie Clare siding and will be hauled to the mill-site in the Gold Mountain district. Recent developments in the Nevada Empress mine may lead to that property entering the shipping list. Some ore, which is much richer than any heretofore found, has recently been uncovered in the lower winze. The Rogers-Syndicate lease, which expires at midnight July 11, has been making a wonderful production the last two weeks, and it is estimated that from $10,000 to $15,000 per day have been taken out.—— The mines of Goldfield produced 2129 tons of ore worth $187,200.——The total output of the Tonopah mines was 5895 tons, of an estimated value of $150,875.

HUMBOLDT COUNTY.

A rich strike is reported from the Stoker lease on the Therien estate. It is claimed that many large specimens have been taken out which are literally permeated with coarse gold.——The hoisting equipment for the Seven Troughs Florence Mining & Leasing Co., operating the Harris lease on the famous property of the Seven Troughs Mining Co., near Vernon, arrived in Lovelock, the nearest railroad point, this week, and is now being hauled to the lease by teams. The equipment includes a 15-hp. Foos-Fulton gasoline hoist, head frame, buckets, and cars.

LANDER COUNTY.

The construction of a 400-ton smelter at Battle Mountain is now an assured fact and preparations are being made to begin the preliminary work on the plant. A number of Battle Mountain men are interested in the project, but the prime movers in the project are not known. Tom C. Parker, of Battle Mountain, is one of the local men who is interested in the enterprise.——The Austin-Hanapah Mining Co. is employing nearly 40 men on its properties at Austin. The Clifton adit is being cleaned out and re-timbered.

NYE COUNTY.

The L. V. & T. railway has announced a reduction of from 50c. to $1 a ton on ores shipped from the Bullfrog

district to Salt Lake valley points. A reduction of $2 a ton on crude oil has been made between Los Angeles and Rhyolite.——The plant of the Nevada Milling & Ore Purchasing Co., at Manhattan, commonly known as the Lemon mill, was turned over this week to Berry & Roche, of Tonopah, who have taken an option and lease on the plant. The work of remodeling the mill will begin at once and the new management announces that the stamps will again be dropping within three weeks' time.

The Bitroff lease on the Black Jack claim has started work again on the 223-ft. level. It is the intention of the company to push the work in the north drift, at this level, as fast as possible.

WHITE PINE COUNTY.

Increased activity is reported from the Blackhorse mining district in the southeastern corner of the county. The French-American Mining Co. is one of the prime movers in the development and is making extensive improvements on its Lucky Boy property. D. A. Brown, of Boston, has recently purchased all the property of the Blackhorse Central Mining Co., including all water-rights and the townsite of San Pedro. It seems assured that a mill will be built in the near future.——A strike 70% copper ore is reported from the Dolly Varden district in the Antelope mountain range just over the line in Elko county.——The Golden Ledge placer mine, at Hogan, in the Osceola district, has let a contract to sink a 100-ft. shaft.

NEW MEXICO.

The Wheley mine, eight miles south of Hachita, has been bonded to a party of Nevada men for $40,000. A cash payment of $5,000 has been made.——The American mine, at the Old Hachita camp, is again under development. Robert Anderson has recently uncovered a shoot of high-grade zinc and silver ore on the 150-ft. level, which is over 60 ft. long. Pumps have been installed and arrangements made to do some deep mining.——The Anderson Apache Copper Co., whose property is in the Hachita district, on June 20 commenced shipping ore to the Copper Queen smelter at Douglas. Within the past year a two-compartment shaft has been sunk and 1000 ft. of cross-cutting and driving has been done.

OREGON.

The Portland Gold Hill Mining Co. has been incorporated, with a capital stock of $100,000, to operate the Standard, better known as the Kubli, mine. The mine is equipped with a two-stamp mill.——Mining affairs in the Sumpter district appear to be on satisfactory basis. After completing repairs to the North Pole mill and the addition of more modern appliances, operations have been resumed and crushing will be continued. Development and mining operations are being carried on in the mine. The Columbia, a neighboring property, is also working full blast, with a more encouraging outlook than has yet been noted. The Golconda is still inactive, with no immediate prospects of an early resumption of work. The E. & E. is also on the inactive list. The Esmeralda is working its usual force, and extracting a fine grade of ore at present, with indications of greater results as further progress is made in development.——The Great Northern gold mines, in Linn county, which at one time promised to become the best-paying property in western Oregon, were sold last week at sheriff's sale for $3875 to J. M. Williams, of Eugene. The mines were originally capitalized at $1,000,000.——The Black Jack group of eight claims, in the Red Boy district, is again under development. The main adit will be driven forward to an intersection with vein No. 10, which it is believed will be reached within 250 or 300 feet.

UTAH.

BEAVER COUNTY.

It is persistently rumored that a consolidation of the Cedar and Talisman properties is being considered. While the management of the two properties do not affirm these reports, it is thought that such a deal is not unlikely.

JUAB COUNTY.

The new electric equipment for the Gemini and the Ridge & Valley mines has arrived and will be installed at once. The shipment includes two big pumps and two hoists. One of the pumps will be put in on the 1700-ft. level of the Gemini and will handle 300 gal. per minute.——The town of Eureka will celebrate the opening of the new Tintic smelter on July 24 and is planning to have a big barbecue. ——The Taylor Brunton Co. will build a 600-ton sampling plant in the Tintic district.——The North Clift Mining Co. has been incorporated to develop three claims south of Silver City. The company is capitalized for 500,000 shares of a par value of 10c. each. Frank Thornberg is president. ——The Mammoth mine, at Mammoth, has been closed for 10 days to allow repairs of the machinery.——The shipments from the mines of the Tintic for the week ending July 3 were 78 carloads.——The machine shop and sampling mill at the new Tintic smelter have been running, but only for limbering up and adjustment, although the management hopes to start sampling in earnest this week. It is now stated the furnaces will be blown in between July 15

Looking Up Bingham Canyon.

and 20.——The new hoisting equipment for the Sioux Con. arrived recently and is now being installed. A new level will be started at the 380-ft. point.

SALT LAKE COUNTY.

The property of the St. Joe Mining Co. was purchased by some of the shareholders of the old company at a receiver's sale last week. The price was $25,000, of which $5000 was paid in cash, the rest to be paid when the sale is approved by the court. The mine is in Bingham and has a mile of underground workings and some surface improvements. There is between $60,000 and $65,000 of indebtedness outstanding.

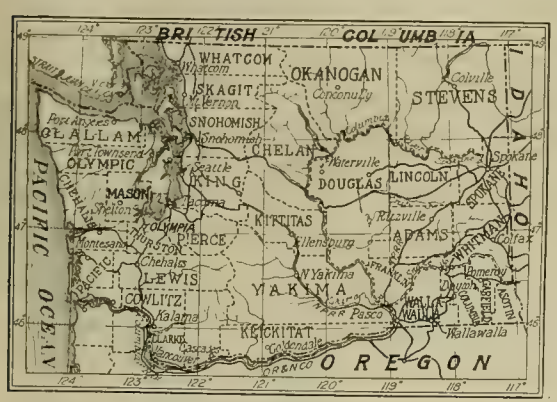
SUMMIT COUNTY.

The stockholders of the American Flag Mining Co. will hold a special meeting at Park City, July 11, to ratify the issuance of bonds in a sum not to exceed $150,000, the proceeds to be used in the erection of a mill, further development, and to pay off all indebtedness of the company. It is believed that the force at the mine will soon be increased.——A carload of machinery for the Nelson-Queen property arrived last week. The equipment includes two boilers and all accessories.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The lessees of the Republic mine have executed an agreement with J. L. Harper, of Republic, and Wm. L. January, of Detroit, Mich., under which the vendors agree to surrender their lease and option to purchase said mine to the vendees for a sum not made public. The prime condition of the agreement binds the vendees to make the first payment on or before August 10. Another condition is that the vendees are to resume sinking the incline shaft on the Republic vein, which was sunk by the Republic Con. Gold Mining Co. to 125 ft. below the adit level. The present vertical depth below the cropping is 731 ft., and from indications, it is presumed that the rich pay-shoot, which was cut off at about 12 ft. below the adit, may be 'picked up' by sinking deeper. Small pockets of the richest ore ever found in the mine were developed on the 600-ft. or lower adit level, the assays run over $5000 per ton. The most valuable mineral found was selenide of silver, associated with gold.——The Keller & Indiana Smelting & Development Co. held its annual stockholders' meeting at Keller June 22 and elected the directors for the following year. The company has concluded a deal for the purchase of the Manilla mine for $60,000 and made the first payment of $500. The Manilla vein is estimated to be from 85 to 100 ft. wide and is opened by two cross-cutting adits. The ore is partly iron sulphide and assays as high as 4½%



Map of Washington.

copper and 4 oz. silver per ton. The average of ore 70 ft. across the vein is reported to assay $17.16 per ton at the present average prices of copper and silver. A new wagon road is under construction for haulage of the ore to the smelter. The construction of a projected tramway has been deferred. The company expects to blow in the first furnace at the smelter about August 25. R. L. Boyle, of Keller, is the general manager of the company.

Republic, July 7.

OKANOGAN COUNTY.

(Special Correspondence).—The structure for the housing of the Palmer Mountain Tunnel & Power Co.'s mill shed is completed and a large force is at work installing the machinery. From the adit of the mine, drifts are being driven on several of the veins which were intersected, and the average value of the ore struck is reported by the management to be highly encouraging. From the 23rd vein encountered, at a depth of about 1300 ft., a shoot has been developed which shows considerable native gold, and the assays are above the average. As soon as the mill is completed electric power will be used for haulage in the adit.——From the Ruby mine, at the eastern base of Mt. Chopaca, seven carloads of high-grade ore have been shipped to the smelter since last spring. The Ruby vein is irregular in width, and in some places is 10 to 15 ft. wide. Monroe Harman is now at Mansfield, Ohio, consulting with the directors and leading stockholders of his company in regard to establishing a concentrating mill at the mine, the capacity of which has not yet been decided upon. There is enough ore already mined to keep a good-sized mill in operation for some time. The mine has been opened on four levels, but very little stoping has been done. The Victoria, Vancouver & Eastern Railway Co. has built a spur within 400 ft. of the mouth of the adit.

Chesaw, July 7.

STEVENS COUNTY.

The Outcast, a mining property lying between the Eagle and the group of the United Copper Co., in the Chewelah district, has been taken over by the Blue Star Mining Co., recently organized. The company is fully financed and has made arrangements to pay an indebtedness of $13,000 and provide a fund for extensive development work.——It is probable that the smelter of the Colville M. & S. Co., at Park City, will be blown in by August 1.——The concentrator for the Spokane Lead Mines Co. began operation at Metaline on June 20. It is the first in the district.

CANADA.

BRITISH COLUMBIA.

The Sunset claim, near Paterson on the Canadian side of the international boundary, has been sold to William H. Thompson of Spokane for $10,000.——The Dominion Copper Co. has resumed work at its Boundary mines after a shut-down of eight months.——Eight men are now working on the Woodburn claim of the recently incorporated Phoenix Mining, Smelting & Developing Co.——Hydraulic mines on Downie creek, on French creek, and on McCullough creek, in the Big Bend district, north of Revelstoke, will be worked this year. Fifteen men are already at work on French creek.——Work on the North Fork coal mines, near Granite Creek, Similkameen, has been temporarily suspended, some 15 or 16 men having been laid off. The coal measure there has been developed enough to show that a vast quantity is ready. Following is the tonnage of ore shipped from and crushed at the mines of Rossland for the week ending June 27, and for the year to date:

Mine.	Week.	Year.
Centre Star	3,550	86,841
Le Roi	1,470	41,409
Le Roi No. 2	385	12,969
Mayflower	....	35
California-Giant	....	95
Blue Bird	....	110
Red Eagle	....	20
Evening Star	....	488
Totals	5,405	141,967

ONTARIO.

The leasing system is finally being adopted in the Cobalt camp, where heretofore it has not been favored by the owners of the properties which control large undeveloped acreages. The development of Silver Leaf into one of the finest shipping properties in the camp is due wholly to the leasing of the property by E. D. Symmes, a rich contractor and engineer, who supplied the funds necessary for the proper exploitation of the mine. During the present spring a number of leases have begun operations on Peterson lake and have already developed several shipping properties. It is reported that Cobalt Central, Nipissing, and La Rose, the three companies which control the largest acreage in the camp, are considering offers to lease some of their unexplored territory for short periods. If such a policy is adopted it will bring a large amount of new capital into the camp and will hasten the development of the large mineralized area that these companies have not yet been able to work. The productive area of the camp is spreading in all directions as a result of the exploration work which is constantly going on, and new veins are being steadily added to the known stores of silver. The Badger and La Rose have recently encountered rich orebodies heretofore unknown, and during the week the Cobalt Central has discovered on Lot 38 a new calcite vein carrying considerable bloom.

Special Correspondence.

LONDON.

Organization of Boscaswell United Tin & Copper Mines, Ltd. — Aluminum Corporation. — Venture Corporation Report.

Another Cornish mine has been offered to the public this week. Undeterred by the fall in tin and the poor state of some of the companies operating re-opened mines, Mr. Douglas Steuart has taken his courage in both hands and fairly deluged investors with prospectuses. He has spent something like £6000 in advertising in the daily and weekly papers. For two days running there were two whole pages in the issues of several of the leading morning papers. I may say in parenthesis that the *Financial News* did not get what it considered its proper share of advertising, so in characteristic fashion picked holes in the prospectus and in Mr. Steuart's method of business. In addition to all this newspaper advertising Mr. Steuart distributed two million copies of a very carefully prepared prospectus. The name of the company is the Boscaswell United Tin & Copper Mines, Ltd. The mines are on the Cornish coast in the extreme west, and adjoin the Levant & Botallack mines. The company is in the nature of a consolidation, several mines being included in the purchase, namely, North Boscaswell, Pendeen Consols, Trease, Calartha Farm, Boscaswell Downs, Calartha Common, and Portherras. The ground covers over one square mile, and contains a great many tin and copper lodes, some of which extend under the sea, as in the case of the two neighboring mines just mentioned. In the old days they proved profitable, but since 1874 no work had been done on them until 1906, when Mr. Steuart came along. The work now being done has been centred on the Boscaswell Downs lode where it passes through the Trease property. A new shaft has been sunk here to a depth of 180 ft., and it is intended to drive in from the sea-shore about a quarter of a mile away to intersect the shaft at 300 ft. The old workings have been explored as far as possible, though as most of them are under water at present, not much has been done to check the reports of thirty years ago.

Mr. Steuart is a mining engineer of good connections and considerable means. He is at present a partner of the firm of Poore, Pettit, & Steuart, consulting mining engineers. He has some influential men co-operating with him in the Boscaswell business. Among the directors are J. H. Collins, A. K. Barnett, and Dr. O. J. Steinhart, while Solomon James, late manager of mines in Johannesburg, is the mine superintendent. The terms on which the flotation is made are very fair. Mr. Steuart and his friends take deferred shares as purchase price. The capital of the company is £200,000, of which half consists of vendor's deferred shares, and the other half preferred shares, all of which are now being offered for subscription. The property would probably justify this large expenditure, and give excellent results if worked on a large scale. It is, however, impossible to hope that the whole of the money will be forthcoming. A good deal could be done in a smaller way with $20,000 working capital. The preferred shares will rank for their proportion of the profits just as favorably if only a few are allotted as if the whole block were taken up. They are entitled to 7% preferred dividend. Then an equal sum of money is due as dividend on the deferred shares, after which the two classes of shares will divide any surplus profits equally. It will be seen, therefore, that, though 100,000 deferred shares are issued, they will only count as being equal in value to the number of preferred shares issued. The mine and the finances seem all right and it is to be hoped that Mr. Steuart will be successful.

A few weeks ago I wrote some paragraphs relating to the position of aluminum in this country, and I gave some particulars of the British Aluminum Co. I am now in a position to say something of the new company called the Aluminum Corporation, which was floated as recently as the spring of last year. The works in connection with this company have progressed rapidly. Those erected at Newcastle-on-Tyne started operations in March, and those in North Wales should be ready in August or September. When the company was formed the intention was to buy alumina in the open market, a policy the wisdom of which was open to doubt at the time. The Corporation has since found it absolutely necessary to secure bauxite properties and to do its own refining. Mines have been secured in the South of France not far from Marseilles, and the Corporation is erecting, conjointly with the United Alkali Co., a bauxite refining works at Newcastle-on-Tyne. Arrangements are also being made with a firm that rolls copper and brass, to manufacture the Corporation's products into wire and sheets instead of selling the metal in ingots, so that the Corporation should eventually be in a very favorable position for supplying the market.

After a lapse of eight years the Venture Corporation has issued a report and balance sheet. This promoting company has always had a certain amount of mystery surrounding it, and has presented the unusual phenomenon of a practically bankrupt company carrying through some excellent deals. It was formed in 1897 as an amalgamation of a number of other companies engaged chiefly in West Australian business. The capital represented by the West Australian assets amounted to £472,437, but none of this has ever yielded profits nor has it been realizable in cash. Shortly after the formation of the Corporation, America was looked to for new properties to float, and the most important of these was Stratton's Independence. The profits made out of the flotation were considerable at first. Just as a liability had been incurred for something like £400,000 among bankers and others with the object of buying out Mr. Stratton's remaining interest, the collapse took place, landing the Corporation and its directors in a rather serious position. If the exact state of the finances had been published a liquidation would have been necessary. The directors persuaded the shareholders to allow reports, accounts, and general meetings, to stand over until things could be straightened out. In a liquidation probably the creditors would have got nothing, so that it was just as well to let the Corporation go on. Perhaps also, and this is quite in harmony with the usual practice, the directors had given their own personal guarantee when negotiating the loans mentioned, and to have been called upon to fulfill this guarantee might have meant irretrievable ruin to them. Anyhow the company went on in silence for eight years, achieving some success, notably those of Camp Bird, Esperanza, Dolores, and Oroville Dredging. It also carried out the flotation of three first-class engineering firms as limited companies, together with other minor ventures. The debts of the company now seem to be wiped out, but it has no working capital. It is now proposed to wind up and re-construct, including in the new company the shareholders in two other companies that have worked in concert with the Venture Corporation, namely, the London & Continental Investment Corporation and the Mines Corporation of New Zealand. The capital of the new company will be £250,000 in 1,250,000 shares of 4s. each. The shareholders in the three companies will be given 23 shares of 4s. each in exchange for 100 old shares of £1 each, together with the right to subscribe for 100 new shares credited with 2s. paid on each. In this way 345,832 fully paid shares will be given, and 680,000 shares with the liability of 2s. will be offered. If all are issued, the Corporation will receive £68,000 in cash as working capital. The Corporation has in view some important business in connection with Siberian placer-mining.

During the year ended March 31, 1907, the Dharwar Gold Mines Co. secured a gross profit of £26,000. The sum of £12,600 (in scrip) was distributed and a credit balance of £2400 was carried forward, as against a debit of £2900 brought in. Cash and shares at the date of the balance-sheet totalled £26,550, including 18,400 Dharwar Reefs £1 shares at par.

MEXICO.

Oaxaca Smelting & Refining Co. — L. Vogelstein & Co.'s Operations in Oaxaca. — Magdalena Smelter. — Taviche District.

One of the most regrettable effects of our recent financial troubles has been the continued inability of the Oaxaca Smelting & Refining Co. to raise the funds needed to put the company in shape to continue operations to a successful issue. This company was organized in Mexico City some three years ago, and it was supposed to have strong financial backing. O. F. Westland, former manager of the Aguascalientes plant of the American Smelting & Refining Co., was made manager of the new concern, and apparently everything went rapidly and smoothly. After a year's work preparations were made to blow in, and if I remember correctly a short trial-run was made. But there were rumors of international dissentions, of options on certain mining properties that had been counted on but not obtained, and the company soon began to back-step. There have been several reports that its finances had been straightened out and that operations would be resumed, but these were not proved by the events that followed. Now the plant is advertised for sale at auction, on July 7, to the highest bidder, by order of the Court to satisfy the foreclosure of a mortgage on the property. It is said that the bondholders will probably buy it in, though there are rumors to the effect that both the Tezuitlan Copper Co. and the American Smelting & Refining Co. may be bidders. This, however, seems improbable, as the former has its own plant at Tezuitlan, Puebla, not far distant, and the latter has never given much attention to Oaxaca. If outsiders were to appear as bidders for the property, it would seem most probable that it would be the Vogelsteins. They have for some time been seeking a favorable opening in Mexico for a smelting plant, and through the Consolidated Metals Co. they have within the last year become pretty badly tied up in Oaxaca, and are said to have had to take over on first mortgage the San Juan-Taviche & Oaxaca railroad. In order to make something of that, they are pushing on to Taviche. It may be, therefore, that to get out even the purchase of the Oaxaca Smelting & Refining Co.'s plant by the Vogelsteins would be a good move. One of their head men, James A. Schloss, has been giving the Oaxaca business careful study for some time. The Magdalena smelter is also said to be in financial difficulties, and it is understood that suit has been brought to prevent Lloyd R. Hamer from transferring the property to the new company recently organized for the purpose of taking it over. The smelter was blown in May 28, however, after an idleness dating from last November, as there is a large stock of ore and fuel on hand. Whether the Magdalena mines are to be unwatered or not is not stated.

Lack of transportation, and the extremely low grade of the ores in the Taviche district, have always placed a damper on development there, but new hopes have arisen among those interested in Taviche. It is thought that the contemplated ₱150,000 mill (40 stamps with cyanide annex) contemplated for the Providencia-San Carlos, on the Ocotlán river, may be completed by the end of the year, and that it will do custom work on the Taviche, San Martín, and other ores of near-by camps. Another hope rests on the early completion of the San Juan-Taviche railroad into Taviche. The Escuadra, San Juan, San Martín, San Francisco, and Taviche, as well as smaller properties, are all anxiously awaiting the advent of the railroad, which it is believed will reach Taviche some time in September, when lower-grade ores may be handled which the wagon freight now makes prohibitory. All this has led to a renewal of activity throughout the Taviche district; the Conejo Blanco, which had cut off production because of the low price of the metals, and the sinking of the shaft to a depth of 500 ft., has resumed shipments; the Rosario has completed its steel head-frame and development work is being pushed vigorously; the Boston is preparing to resume operations, as is also the La Union; and at the Emmons mill, erected by N. H. Emmons (now with the Tennessee Copper Co., at Ducktown, Tennessee) some five or six years ago, alterations are being made for the purpose of experimenting with the low-grade ores of the Escuadra and San Juan de Taviche. If success be met with in these experiments it will mean a great deal for Taviche. At the San José de Gracia, adjoining the Navidad, recently acquired by the Mexican Mines-Prospect Development Co., of Mexico City, a 10-stamp and experimental cyanide mill will soon be installed to study the treatment of its ores, of which it is said an amount valued at ₱300,000 has been blocked out.

NOME, ALASKA.

Spring Clean-up.—Difficulties in Exchange. — Wild Goose Pumping Plant.—'Second' and 'Third' Beach Output.— Nettie and Mabel Benches.—Wild Goose Co. — Sub-marine Beach Discoveries. — Anchor-Ice.

The mountain-like dumps of pay-dirt, which were extracted during the winter along the various Nome beach pay-streaks are fast disappearing, and the spring clean-up of 1908 will produce not less than $3,500,000. This is considered a conservative estimate, based on measurements of the yield of last year. The mining operators of Seward Peninsula have been busy this winter, and the gold is gradualily flowing into the local banks. Much more will be shipped to Seattle and San Francisco than in former years, due no doubt to the scrip circulation still in vogue at Nome. Many of the mining men who went out last fall with certified checks from the Nome banks and had their deposits withheld, are still smarting under their hardships and are temporarily depositing with local merchants until an opportunity presents itself to ship direct to outside mints.

A visit to the various camps recently disclosed busy scenes of sluicing. Many operators have finished cleaning up their winter dumps and are preparing for renewed activity in summer work. Several big electric dredging machines are being installed on Wonder, Bourbon, and Dry creeks. The summer operations of 1908 will eclipse those of all former years, and this section of Alaska will undoubtedly produce nearly $7,000,000. Along Center creek, hardly two miles distant from Nome, mining operators have mainly confined their winter work to running drifts and blocking out 'pay-dirt,' that is to be sluiced during the summer, by water furnished from Snake river. The Wild Goose pumping plant was recently leased for this purpose by a new company, composed of Fleming Bros. & Hanks, Ernest Blank, the Eagle Mining Co., and Vogel & Williams. Notwithstanding this, there has been hoisted to the surface, from the different workings along Center creek, not less than $40,000 worth of pay-gravel.

The 'second beach,' the oldest of the pay-streaks, in point of discovery, which parallels the present shore-line for over twelve miles eastward from Nome, is still contributing its quota of fine beach-gold, and a number of scattering outfits thereon will clean up not less than $20,000 to $25,000 this spring. Eastward from Snake river, lying at the base of Anvil peak, back of Nome, the famous 'third beach line' looms up with pay dumps that look like mountains, from which a modest estimate calculates the output at $1,500,000. The Pioneer company has employed about 150 men all winter on this product and the claims operated are Discovery on Little creek, the Ault claim, Portland and Metson benches, Standard, and Gertie. All these have heretofore been big producers and will be operated this summer by the latest equipment for enonomic summer-work. Practically the only dumps of any consequence, west of Snake river, on the 'third beach,' were those of Sullivan, Berger, and Payne, at the intersection of Sunset creek, on the Oakdale claim, where the output is computed at about $100,000. The Three Star Fraction and the Carson claim near Wonder creek, are sluicing up 75,000 cars of dirt, valued at $200,000. These are the properties of E. W. Johnston, of Seattle, which created such excitement last year by their enormous production.

About $250,000 will evidently be produced by the Slough-Over Beach Streak from dumps on Graham's Discovery, by Crabtree and Waskey; the Yellow Jacket, operated by Hall and Elliott; and the Discovery, on Wonder, which is worked by Plein, Bosworth, and Clowes. Grigsby, Shea, Lowden, Grant, and White, of the Nettie bench, and Connors, Stewart, and Kelly, of the Mable bench, will clean up about $40,000 jointly. Sunback and Morris, on the Cyrus Noble claim, have taken out about 2000 cars of pay-dirt, while Halla and Webb, who have been working all winter on the Diamond L. claim, have an immense pay-dump, the value of which, jointly, will aggregate $30,000.

At the intersection of Dry creek and the third beach, the richest dumps are on the Ingleside claim and the Rainy Day. Fully $200,000 is the estimated product from these for last winter's work. In that vicinity the Wild Goose Co. will clean up nearly $250,000 from the Discovery claim, which heretofore had been considered of no value. Recent purchases there by this company include the North Pole, the Happy New Year, the Sour Dough, and Leap Year claims, all of which are in the same neighborhood,

Map of Alaska.

though previously considered off the pay line. Including No. 9, on Otter creek, the Alta, and the Jupiter claims, it is calculated the Wild Goose's operations will aggregate fully $200,000. East of the Nome river, the third beach operations during the winter were lined up on the Lakeview, No. 7 Cunningham, the Dublin, Yellowstone, Good Hope, Inch Fraction, Sunnyside, and Sour Dough claims, all of which have out on the surface some very rich dumps that are now being sluiced. The new submarine beach grows apace, and drilling operations have disclosed pay-dirt as continuous from Snake river northward through Nome's old graveyard far out to sea. During the winter drilling was carried on by means of portable derricks out on the ice. The new pay-streak, while generally termed 'the submarine beach,' is really a stream wash of ancient origin, probably the Cretaceous period. It is found running north and south at a depth of 29 to 35 ft. below the present sea-level, or about 60 ft. from the surface. Strange to say, the drilling operations conducted through the ice last winter, after passing through the water, again pierced frozen ground, or 'anchor-ice,' underneath until a solid schist bedrock was reached. The gold is coarse, and nuggets are common. For summer exploitation caissons will be installed where shafts are necessary. Candle, Kongarok, and the Council districts have also been very busy this winter and will swell the winter's production of placer-gold from Seward Peninsula about a quarter of a million dollars.

BUTTE, MONTANA.

June Production. — British-Butte Dredge. — Butte & Superior. — Barnes-King Co. — Butte & New York Mining Co. — Visit of J. Parke Channing.

Because of the floods the June output fell 50% below normal, the production of copper from the Butte district being estimated at 13,160,000 lb., derived from a total of 150,350 tons of ore.

Although the British-Butte Mining Co. is engaged in a fight with the United States Government over title to the placer ground it occupies near Butte, it is announced that the company is preparing to begin dredging operations on a large scale. President DeHora has placed an order with the Risdon Iron Works of San Francisco for a dredge which is to cost $80,000. This will be installed by October. The company is trying to get title to about 1000 acres of ground. So far as tested this will average 50c. per cubic yard. The dredge will have a capacity of 3000 cu. yd. per day. It will be operated, lighted, and heated by electricity, a contract for power having been made with the Madison River Power Co. The dredge will dig from a depth of 30 ft., but still greater values lie deeper, the best assays having been obtained at a depth of nearly 1000 ft. If the dredge proves successful some scheme will be devised for mining to a greater depth. A shaft has been sunk to a depth of 680 ft., and from that a bore 310 ft. deep has been made without striking bedrock. At 680 ft. a cross-cut has been run east with the intention of cutting the rimrock and sinking on it. A number of cyaniding tests have been made and 96% of the gold saved. A cyaniding plant may be installed in addition to the dredge.

The work by the Butte & Superior Co. is limited at present, pending the arrival of a large new electric pump, which is expected shortly. The shaft is down 1175 ft., and it is the intention to install the pump at the 1200-ft. level. The big vein which was cut on the 1000-ft. level recently has not been explored, but will be as soon as the new pump is in place. The Lion Gulch Mining Co. has started a three-compartment shaft on its property in the Continental district, eight miles southeast of Butte. The company is employing 30 men, most of whom are engaged in building a wagon-road from the railroad to the mining property, in order to bring in new machinery to equip the mine for deep sinking. Operations are under the management of John Hewitt, formerly superintendent of the Gagnon mine, and later in charge of operations for the Amazon-Butte Company.

The shaft of the Tuolumne Mining Co. has been sunk to a depth of 1050 ft. and 1906 ft. of cross-cuts and drifts have been opened. Three stations have been cut and two veins have been prospected on the 1000-ft. level. The apex of two orebodies has been encountered in the south vein, the orebodies having a combined length of 600 ft., but the ore is not of commercial value at that depth.

Owing to the heavy June rains open-cut mining was suspended by the Barnes-King Development Co., and mining was confined to the underground workings, the faces of which have lately been in better ore. The increase in value of the ore has been gradual for several months. In April the heads—assays from the crushed ore—averaged $4.19 per ton; in May $4.26, while the first week in June the average was $5.48, rising in the second week to $6.03. The value of the bullion produced in May

was $20,946, and the company's expenditures are understood to have been about $25,000.

It is announced that the Butte & New York Mining Co., the holding company for the Butte Milwaukee Co., has succeeded in raising money with which to resume development work on the property in Butte. The company also gives the cheerful announcement that the books are open to the inspection of stockholders. A statement of the Butte & New York Co. declares that the company is free from debt and is the owner of its mining property in fee simple. The Butte-Milwaukee Co. is the real owner of the mining property which the Butte & New York Co. is developing. The latter company was organized on a majority of the stock of the Butte-Milwaukee Co. and the minority stockholders have never been able to understand their relation to the new concern, which was organized for the purpose of raising money in the East and to prevent the outstanding Butte-Milwaukee stock from depressing the market while the Eastern interests were selling stock to raise money. It has been announced that the Butte-Milwaukee stock would be made exchangeable for Butte & New York, but the stockholders have never been notified of it. A new three-compartment shaft on the Colonel Sellers claim, belonging to this company, is now down 700 feet.

W. P. Jahn, of Milwaukee, president of the Pilot-Butte Mining Co., has been in Butte for some days directing preparations for a resumption of work on the Pilot claim. A shaft 530 ft. deep was sunk on the claim before work was stopped from lack of funds. Money has been provided and sinking is about to be resumed. The Pilot claim is situated in a fine section of the Butte district, adjoining the Elm Orlu, one of Clark's producing mines, and it lies near some of the North Butte and Butte & Superior mines.

J. Parke Channing was in Butte last week looking over the properties of the General Development Co. and the South Butte Mining Co. The mineral ground owned, or claimed by the latter, is nearly all involved in litigation, and until that is settled the company does not know whether it owns any mineral deposits or not. Speaking of this disputed ground Mr. Channing said: "Copper is there in paying quantities, sufficient to warrant operations on a large scale, and the clearance of title will be followed by the sinking of two large shafts. However, until the courts decide the legal questions involved it would be futile to contemplate operations." Mr. Channing is on his way to Globe, Ariz., where a 1000-ton concentrator is to be installed at the Miami properties. He says the Miami Co. has 4,000,000 tons of 3% copper ore in sight and can make copper at a cost of 9c. per pound. Speaking of the copper situation he said: "I believe the price of copper will advance very soon. The consumption keeps pace with the progress of commercial business and manufacturing industries, and in these there is a decided improvement. The copper market is bare, and there are no large stores in Europe or America. There was infinitely more copper in the country when the metal was selling at 25c. than there is today."

TORONTO, CANADA.

Serious Fire at Cobalt.—New Vein on the La Rose Claim.—Nipissing Ore-Reserves.—Geological Survey Work.—Dominion Coal Company.

Considerable loss to mining companies in the Cobalt area has been occasioned by bush fires, which for some days ravaged the southeastern portion of Coleman township. The principal losses occurred on June 28, when the buildings and machinery of several properties were consumed, the men in some cases barely escaping with their lives. The Columbus, Lumsden, Shamrock, Fisher-Eplitt, Cochrane, and Columbus Development lost their buildings and plant, and in several other instances properties were saved only by the most strenuous efforts of the miners. The town of Cobalt escaped and none of the larger shipping mines were injured. Some injury was also done at the new camp of South Lorraine or Silver Centre, many prospectors losing their outfits.

The Standard Cobalt Mines Co., one of the subsidiary companies of the Cobalt Central, has leased 40 acres adjoining the Big Pete on the south. The lease, which is from the Bailey Cobalt, is on the basis of 50% royalty. The period is for two years with an option for three additional years.

At the La Rose mine, Cobalt, a notable discovery, indicating the continuous richness of the property, has been made 60 ft. southwest of the main shaft at a depth of 35 ft., consisting of a blind vein, running parallel to the main vein and having a high silver content. Prof. Hidden, of Newark, N. J., who is preparing a report on the La Rose and was in the camp at the time, confirms the value of the find. The Nipissing has now a force of 302 men engaged in mining and prospecting, and the management hopes to double the amount of ore-reserves this summer. The available ore now has an estimated value of about $900,000. It will take about two months to reach the strike recently made by diamond-drilling on the Kendall vein 300 ft. east of the shaft. A nugget of pure silver, claimed to be the largest ever taken from any mine, and valued at $3000, has been sent to New York from the Nipissing property for exhibition on Wall Street. Contracts have been entered into for extensive diamond-drilling on the Hazel Jule property on Sasaginga lake, in the expectation of tapping continuations of the rich veins on the properties adjoining the Hudson Bay and the Coniagas. Work on the University claim, which was a big producer in the early days of the camp, is being resumed as a consequence of the La Rose merger. Some high-grade ore is being taken out of the adit at the 100-ft. level. W. Hamilton Wilson, who has recently returned from the Brazilian diamond fields, is pushing development work on his properties in the South Lorraine camp, and has struck a promising calcite vein, having a good silver content. Ore shipments from Cobalt for the week ending June 27 amounted to 405 tons, from the following mines: Buffalo, 21 tons; Coniagas, 31; City of Cobalt, 58; Drummond, 20; McKinley-Darragh, 29; Nipissing, 31; O'Brien, 31; Right-of-Way, 30; Temiskaming, 60; Tretheway, 66; and Watts, 30 tons.

The operations of the Canadian Geological Survey have been considerably hampered this season by want of funds, owing to the delay of Parliament in making the necessary appropriations. The difficulty has at last been overcome, and a number of parties have been sent out, that should have started earlier in the season. Among the more important undertakings by the Survey are the explorations on the Churchill river by W. McInnes, embracing a region which may possibly be opened up before long by the Hudson Bay railway; the study of the economic geology of the Montreal river area near its head-waters by W. H. Collins; and investigations by M. E. Wilson in the district north of Lake Temiskaming in Quebec province, where prospecting for gold is being steadily carried on.

There has been great activity in coal mining in Nova Scotia this season. The output of the Dominion Coal Co. for June was 347,000 tons, as against 319,000 in June 1907. For the first six months of the year the output was 1,924,619 tons as compared to 1,653,720 for the corresponding period last year.

The prosecutions which were threatened for the violation of the law regarding prospectuses in connection with Lawson's flotation of the Yukon Gold Co. have not materialized. The matter was brought to the notice of J. J. Foy, Provincial Attorney General, by J. C. Murray of the *Canadian Mining Journal*. The Government, however, declined to undertake a prosecution while the Provincial elections were pending. Although nearly a month has elapsed since election day, no action has been taken. There has been much complaint of the slackness of the Attorney General's department, not only in several cases arising in connection with joint-stock company-promotions which are hanging fire indefinitely, but as regards the enforcement of the law where financial or political interests are involved.

SEVEN TROUGHS, NEVADA.

General Topography and Geology.—Mills in Operation.—Mazuma Hill Mining Co.—High-grade Ore.—Mazuma Mining & Development Company.

The Seven Troughs mining district is on the eastern slope of the Stonehouse range of mountains, 30 miles northwest of Lovelock, in Humboldt county, Nevada. This range has a north-south trend and is chiefly a rhyolite country, having belts or zones of andesite and basalt carrying mineralized veins. There is one principal zone of this character, and perhaps two others, not so well defined, all striking north-south along the eastern slope of the range. The principal zone is of considerable width, and contains several parallel veins on which important development has been performed. These veins have a dip of approximately 60°, and a width of two to twenty feet. The walls are andesite and basalt, and the gangue, or vein-filling, consists of quartz, talc, and silicified rhyolite, carrying gold and silver in the ratio of about one ounce of gold to one of silver. The mill work now being performed in the district demonstrates that 90% of the precious metals can be recovered by amalgamation. The ores contain a small percentage of pyrite, which is caught by Wilfley tables and vanners, making a concentrate that is high grade.

The district is marked by a series of shallow canyons which head near the crest of the range, and drain easterly to an extensive flat which separates Stonehouse range from another range to the east. Where these canyons cross the vein formation the out-croppings are most apparent, and at these points are the original workings of several of the properties. It is in these canyons that the erosion has exposed the veins. In approaching Seven Troughs district from the east, crossing the divide between Humboldt valley and Stonehouse flat, one gets a bird's-eye view of the district, showing the parallel canyons referred to, and several of the little mining towns that mark the various centres of operation. The town of Mazuma is at the mouth of Seven Troughs canyon, and the 10-stamp mill of the Mazuma Hill Mining Co. is situated at this place. The town of Seven Troughs, which marks the location of some of the best properties, is about two miles farther up the same canyon. At the mouth of an arroyo to the south of this is the town of Vernon. The three canyons north of, and running parallel to, Seven Troughs, are known as Wild Horse, Burnt, and Stonehouse. Some important mining development is going on in Wild Horse canyon, and Burnt canyon is of interest as one of the main sources of the water-supply for the district; and Stonehouse canyon has some promising mining properties under development, the town of Farrell being situated there. The distance from Seven Troughs to Stonehouse canyon is six to eight miles. The principal mineral zone, above referred to, appears to extend from near Vernon in a northerly course to Stonehouse canyon and possibly beyond. It may be observed that the initial points for mining on this zone are at the intersecting canyons referred to.

The district contains two 10-stamp mills, both in operation; at least 20 gasoline hoists, and it is estimated that about 200 men are at work, including the lessees. A good grade of ore has been found on perhaps 15 properties, but a brief account of the workings and characteristics of a few of the principal ones will be typical of the best in the district.

The Mazuma Hill Mining Co., controlled by John Harnan and associates, has six claims on the north side of Seven Troughs canyon, covering a considerable distance along the strike of the principal zone, which on this group contains four or five parallel veins. The principal development consists of a 650-ft. adit-level on one of the strongest veins; a second adit, 100 ft. above this, has been driven 400 ft. on the same vein; and two winzes have been sunk on the vein, each 100 ft. below the main level, and from the base of these winzes extends 400 ft. of driving on the vein. One of the winzes is used for hoisting ore to the main level, at which a gasoline hoist is stationed. Three raises connect the main adit with the upper level and all ore from the latter is passed through chutes to the main level, which is provided with trackage to the ore-bins. The vein is 20 ft. wide in places and narrows to 3 ft. in others. This company's 10-stamp mill is said to be operating on ore that averages $40 per ton. There are high-grade streaks in the mine which yield from $300 to $1000 per ton. The plan is to mix the different grades and mill all the material between the vein walls.

There are several leases on other parts of the group, among which are the Reagan, Prior & Chadburn and Bradley, all of which are on veins that run parallel to the Mazuma's main vein. These leases run two years and are all active, the Reagan having shipping-ore.

The Mazuma Mining & Developing Co., managed by H. C. Sandifer, has a lease on ground extending south from Mazuma hill, but on the opposite side of the canyon. They sank a 100-ft. shaft and ran a cross-cut east to one of the veins and will now sink a shaft on this vein.

The Kindergarten Mining Co. has holdings that cover the series of parallel veins on the principal zone, but on the south side of the Seven Troughs canyon.

SALT LAKE, UTAH.

Silver King Consolidated Versus Silver King Coalition.—New Mill for American Flag.—Bingham Output in June.—Ohio-Kentucky at Pioche.

Notices have been sent by the United States Smelting, Refining & Mining Co. to contract-shippers, informing them that ore will be accepted again. The lead department of the smelter will be in commission about August 1, but the date when the copper furnaces will blow-in is indefinite. Only the lead section is permitted to run under the provisions of the decree issued from the Federal Court. The Company has expended a large amount of money in the installation of new processes and devices for the elimination of the elements contained in the fumes which endanger and destroy vegetable life.

A special meeting of shareholders of the American Flag Mining Co., of Park City, has been called for July 11, at which time the matter of issuing $150,000 worth of bonds will come up for consideration. If the bonds are authorized, as no doubt they will be, the proceeds will be applied toward providing mill facilities.

The application of the Silver King Consolidated Mining Co., for an order of court permitting its engineers to survey and examine certain workings of the Silver King Coalition mine at Park City has been granted, the former being the plaintiff in two suits filed recently charging the defendant with trespass. It is claimed by the Consolidated management that ore to the value of $5,000,000 has been extracted unlawfully. The case promises to be one of the most interesting ever tried in the Utah courts.

The month of June was a record-breaker in regard to tonnage from the mines of Bingham. The Utah Copper Co. sent to its mills an average of 135 car-loads per day; the Boston Consolidated output averaged 30 car-loads, while the Utah Consolidated forwarded about 50 car-loads. Numerous small properties were shippers, while the Yampa mine contributed to its smelter by tramway about 700 tons daily. Indications point to early resumption at the Ohio Copper mine, as well as the completion of the concentrating mill, which is destined to handle an output of 2000 tons per day.

The Ohio-Kentucky Mining Co., with mines at Pioche, Nevada, but with headquarters at Salt Lake, has purchased the Nevada-Pioche group of claims at Pioche, consisting of eight claims. The acquisition is advantageous to the Ohio-Kentucky in the way of giving immediate access to a large orebody on the 400-ft. level, as well as providing a good mill-site. The Nevada-Pioche is equipped with a good hoisting plant over a well timbered double-compartment shaft.

The Independent smelter near Ogden will begin operations this week, and will operate one matting furnace. Custom ore is being received principally from mines south of Salt Lake, mostly from southern Nevada, and Idaho and Montana points.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Two fundamental rules for the guidance of surveyors in the re-survey of lands, other than mining claims, are these: (*a*) Marked lines and courses control courses and distances. (*b*) Monuments determine boundaries and transfer all the land included. In other words, the existence of undisputed or conclusively proven monuments, establishes the limits of a parcel of land, even though the description in the deed does not conform to the positions of the monuments. And in case some of the monuments are missing, the surveyor should remember that his survey is to determine where the original monuments were, and not where they ought to have been.

Pan amalgamation of silver ores has made no progress in recent years, since the introduction of the Boss continuous system. With the improved forms of roasting-furnaces now available it would probably be most economical to precede the actual pan-amalgamation by a chloridizing roast. The old method consisted in introducing from 6 to 18 lb. common salt and 3 to 9 lb. copper sulphate into the charge, cupric chloride being formed, which reacts with silver sulphide as follows:

$$Ag_2S + CuCl_2 = CuS + 2AgCl.$$

Only the native silver or the silver chloride are available for amalgamation with the mercury.

Clays are ultimately derived from the decay of older rocks, the finer particles resulting from this decay being carried off and deposited by streams along their channels, in lakes, or along parts of the sea-coast, or in sea-bottoms as beds of clay. In chemical composition clays consist essentially of silica and alumina, though iron oxide is almost invariably present in varying amounts, while lime, magnesia, alkalis, and sulphur are of frequent occurrence, though usually only in small percentages. The term is applied to fine-grained unconsolidated materials which possess the property of plasticity when wet, while they lose this property and harden on being strongly heated.

A placer patent conveys title to all lodes or veins the tops or apices of which are found within the patented boundaries, and which were not known to exist at the time the placer patent was applied for. If, at the time application for patent was made, any such lodes or veins were known to exist within the placer boundaries, they are excepted out of the placer patent, and may be located by any qualified locator, with 25 ft. of surface on each side of the vein. But no one has a right to invade the limits of a placer patent for the purpose of prospecting for lodes, or locating them, unless it is clearly established that their existence was known prior to the filing of the placer patent application.

Peat is a fuel of high calorific power, and is used in large quantities in many European countries for domestic purposes. As an industrial fuel it has not attained high rank, and all attempts to utilize it in America have been economic failures. The difficulties presented in the use of peat are many. The ratio of volatile combustible to fixed carbon is excessive, resulting in a tendency to flash-fire. The ash content is invariably high, ranging from 20 to 40%, so that when the volatile materials have distilled off, the proportion of ash in the residual coke is so enormously in excess of the remaining fixed carbon that it is difficult to maintain combustion of the latter until it has been consumed. Furthermore, peat as dug from its beds is always saturated, and owing to its porosity it holds the moisture tenaciously. It therefore becomes costly to reduce the percentage of water to 10%, while elimination of the water below that amount is economically prohibitive. Other fuels must be very costly before peat, even when found near the point where it is required, can be economically substituted.

If the owner of a mining claim resumes work on the last day of the calendar year, and thereafter continues with reasonable diligence to prosecute it until the full amount necessary to protect the property from re-location is performed, the law is satisfied. No valid re-location may be initiated so long as the work is in progress. Where a group of claims is involved, the work may be done on one of the claims, if such work would manifestly and obviously tend to develop them all and the aggregate amount done after resumption is equivalent to $100 in value for each claim in the group. There is some danger, however, in confining resumption of work to one of a number of claims. The re-location of the others by an outsider would place the burden on the original locator to show, by a preponderance of evidence, that the resumption was in good faith, and that the work being done on one was obviously for the benefit of all. It would be much safer to resume work on each claim.

Plaster of paris is pure gypsum finely ground and calcined at a temperature less than 400°F. If the gypsum is not pure, or if certain materials be added, the product of the calcination is the so-called cement-plaster. If pure gypsum, broken into lumps, but not finely crushed, be subjected to a heat of about 932°F. for three or three and one-half hours, the product is the so-called flooring-plaster, and is therefore a pure plaster entirely free from water. Hard-finish plasters, known commercially by such trade names as Keene's cement, Parian cement, and the like, are the product of the calcination, at or above a red heat, of gypsum to which other substances, usually alum or borax, have been added. Plaster of paris differs physically from cement-plaster in that it is much quicker-setting. Flooring-plaster, while not utilized in England or the United States, is employed largely in Germany for floors, and gives a very hard and durable surface. The material attains this hardness only when it is protected from moisture while setting, and to obtain the maximum density it must be tamped after standing for about 12 hours. Hard-finish plasters are very fine-grained white powders, with a slow rate of setting.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cyanide Costs.

The Editor:

Sir—I was interested in the statement of Liberty Bell costs of precipitation and clean-up for the month of March, 1908, as given in your issue of June 13. The figures herewith submitted cover the same costs at the plant of the Desert Power & Mill Co., Millers, Nevada, for the month of May, 1908, and are on the same lines as those given by Mr. Moulton, not including the distributed charges of superintendence and depreciation. They may be interesting for comparison, showing the cost in different localities and under different conditions:

Ore milled, tons of 2000 lb.	13,830
Solution through zinc-boxes, tons	81,000
Precipitate recovered and dried, lb.	27,947
Bullion from precipitate, oz.	291,412
Metal in precipitate, per cent.	71.5
Bullion fineness, gold and silver, per 1000.	972.6

COSTS.

Precipitation:		
Zinc, 23,733 lb.		
Cut at plant, 15,969 lb. at 9.6c.	$1,529.94	
Shavings, 7,764 lb. at 13.6c.	1,006.32	
		$2,536.26
Cutting 15,969 lb.		141.00
Power and supplies		222.45
		$2,899.71
All solution was pumped through boxes.		
Clean-up and Filter-Pressing:		
Labor of cleaning and re-packing boxes	$ 519.45	
Four clean-ups are made per month. There are 17 seven-compartment boxes, each compartment having 15 cu. ft. for zinc-space.		
Total zinc capacity, 1785 cu. ft.		
Refining:		
Acid treatment of precipitates is not used.		
Drying and melting:		
Coal, 7500 lb., at $19.44 per ton	$ 72.90	
Coke, 31,572 lb., at $17 per ton	268.37	
Fluxes:		
Fluorspar, 158 lb.	8.41	
Borax, 5454 lb.	418.34	
Borax glass, 100 lb.	20.50	
Soda, 2699 lb.	112.01	
Crucibles	167.34	
Labor	725.55	
Repairs and sundries	116.60	
Power	18.30	
		1,928.32
Total cost		$5,347.48
Cost per ton of solution:		
Precipitation		$0.0358
Clean-up and filter-pressing		0.0064
Refining		0.0238
Total		$0.0660
Refining cost per troy ounce of bullion		$0.0066

Labor is paid $4 per 8-hr. shift, refinery helpers $4.50 per 8-hr. shift, and two refinery men receive $160 and $145, respectively, per month.

A. R. PARSONS.

Tonopah, Nevada, June 16.

Cornish Pumps.

The Editor:

Sir—I am interested in the correspondence under the above heading that has appeared lately in your paper. For the last five years I have had a good deal to do with Cornish pumps of the old style, having four or five of them constantly at work in mines under my management in this district (Linares, Provincia de Jaén, Spain). Previous to this I had had a good deal of experience with other classes of pumps in various mines in both North and South America. Fortunately, I have never had to deal with millions of gallons of water per 24 hr., so my remarks will doubtless be of little interest to those unfortunate people who are required to deal with such exceedingly wet mines. So far I have had to tackle only from 200 to 250 gal. per minute, but this amount has had to be raised through vertical heights of from 1500 to 1900 ft., and were that amount to be doubled and the heights increased by another 1000 ft. or so, I confidently believe that my present convictions would hold good. I do not propose to present figures as to the duty and other more or less theoretical computations as to what a mine-pump should do, but to confine my remarks to what Cornish pumping engines have done and are actually doing in a district that has produced and is still supplying a large percentage of the world's production of lead.

Linares is a district where labor is cheap and efficient, while masonry construction is cheaper than its timber equivalent in most western American mining camps. If a shed be required for the foreman's donkey, or a prop be necessary to carry a launder over the dressing-floors, both would be built of good sound masonry. I came to the district with the belief that the Cornish pump was obsolete, that it should be replaced at the first possible opportunity by something more modern and theoretically perfect. I am now convinced that I shall leave it with the conviction that the mine manager who desires absolute freedom from pump-worries, coupled with the comforting knowledge that he can at any moment continue the sinking of his shafts, or cope with a sudden increase of water, without doing more than add a lift to his column or increase the number of his engine strokes, had better forget his prejudices and put in a Cornish pump. It is perhaps well to note here that many of the so-called failures of Cornish pumps have not been true Cornish pumps at all. Some have been German imitations or 'improvements'; others have had Cornish pit-work with horizontal engines with crank and fly-wheel. These abominations, coupled with ignorance or neglect during installation, have done much to create the prejudice which exists today against what is really the most reliable and practically efficient of all mine-pumps.

I propose to briefly describe one or two of the oldest pumping installations in this district as typical of a dozen or more similar ones that are today doing yeoman service, and I can then safely leave it to your readers to judge for themselves what trustworthy old servants these much-abused Cornish

pumps have proved themselves to be. About the year 1861 the Linares Lead Mining Co. bought a second-hand 60-in. Cornish engine in Cornwall, and shipped it to Linares. It was erected at the Santo Tomás shaft of the old Pozo Ancho mine, and was, I believe, the first Cornish pump installed in the district. The pump continued to work until the year 1883, the shaft at that time being down to the 11th or 780-ft. level. It was also working a pump in another shaft situated a quarter of a mile distant, by means of flat rods. The western end of the mine then began to look more promising, and the workings there being deeper, they were more heavily watered. The pump was therefore moved and re-erected at Peill's shaft. A new steam-cylinder, piston-rod, and condenser-chamber were put in. This pump is working today most satisfactorily, handling all the water from the Pozo Ancho mine from a depth of 1830 ft. There is a 60-ft. stand-pipe on top of the column at the surface, and all the mine-water is pumped up to a reservoir a quarter of a mile away from the shaft under a head of 40 ft. The length of stroke of the pump in the shaft is 9 ft., it is raising approximately 200 gal. per minute, and apparently has done so for the last 47 years in Spain, before which time no doubt its happy childhood was well employed at home. The boilers consist of two comparatively new Cornish-Galloway boilers, 28 ft. long by 6 ft. 6 in. diam., with another old one as a stand-by. The working pressure is 45 lb. per square inch, and the normal number of strokes per minute is 4½. The plunger-holes are arranged in the shaft as follows: a certain amount of water is taken into the cistern at the 1068-ft. level from the eastern section of the mine:

13-in. pole at depth of	270 ft.	from surface equals	270-ft. lift
13-in. pole at depth of	540 ft.	from surface equals	270-ft. lift
13-in. pole at depth of	810 ft.	from surface equals	270-ft. lift
13-in. pole at depth of	1068 ft.	from surface equals	258-ft. lift
12-in. pole at depth of	1320 ft.	from surface equals	252-ft. lift
11-in. pole at depth of	1440 ft.	from surface equals	120-ft. lift
10-in. pole at depth of	1560 ft.	from surface equals	120-ft. lift
8-in. pole at depth of	1680 ft.	from surface equals	120-ft. lift
8-in. bucket lift at	1830 ft.	from surface equals	150-ft. lift
Total			1830 ft.

There is an underground balance-bob, at the 930-ft. level, as well as one at the surface. The pump-rods are 12 in. square, and about 42 ft. long. One or two at most are changed every year. A rod of Spanish pine costs 90 pesetas or 18 pesos; one of foreign pine costs about 150 pesetas or 30 pesos. One of the latter will last from 15 to 18 years. The fuel burned is a long-flame soft Spanish coal, called screened Puertollano. It is a dirty coal, of second-class quality. The pumping-engine consumes 170 tons per month of this coal, which works out at about 6 lb. per horse-power per hour. The mine-water contains much lime and other substances, which form a deposit in the column and so reduce its effective diameter, the original inside diameter of the column being 14 in. There are no air-vessels or other 'fakes' in the column. The rods and poles work so quietly and smoothly that it is often difficult to realize there is a pump at work in the shaft.

A watchful Cornish foreman keeps a fatherly eye on the whole system, but a Spanish pitman at 75 cv. per day, with the aid of a little tallow keeps the whole mass moving sweetly. It is often a source of joy to the manager to watch a beautifully polished black plunger-pole make its slow, majestic, silent plunge into the stuffing-box and come to rest with that rhythmic sound that means the valves are seating nicely, and to see a little clear water ooze up through the packing, showing that it is taking in no air, the while ruminating on the fact that this process has gone on for the last half-century, and to all appearances could continue to do so for all eternity. Another Cornish pump, at work in Taylor's shaft at the Los Quinientos mine, belonging to the same company, is a comparatively modern affair. This was purchased new and installed in the year 1871, and for the last 37 years has pumped all the water from one of the most profitable mines of the district. It is a comparatively small mine, and only makes about 100 gal. of water per minute. The shaft has reached a depth of 1650 ft. The engine has a steam-

Peill's Shaft, Linares, Spain.

cylinder 53 in. diam., with a 9-ft. stroke. Steam is supplied by two new Sandycroft Cornish boilers, 28 ft. long by 6 ft. 6 in. diam. The working-pressure is 50 lb. per square inch. Three years ago the increased mine-development led to an increase in the incoming water, and the speed of the pump got up to a normal of 6½ strokes per minute. This is too fast for a Cornish pump to work at its best. It was decided to increase the size of the poles and the column. The new column is of steel, and the H-pieces and valve-casings were made of an improved design, so that higher lifts were possible, four poles replacing six of the original ones. Everything was prepared, and the new pit-work was ready in the shaft, so that it only required to be bolted and strapped to the existing rods. These connections were made after a short stoppage, and the same engine and rods started up again. The normal speed was at once reduced to 3½ strokes per minute, and a saving in coal of over £300 was effected in the first six months' work. Still there are people who maintain that a Cornish pump is a clumsy, ponderous, unhandy affair. I maintain that it is the most elastic and accommodating of all mine-pumps. In

this pump as now arranged there are some fairly high lifts; they have never given the slightest trouble from the day they started to work, and the shaft is as dry as the proverbial bone. The poles are arranged as follows:

10-in. pole at depth of	331 ft.	from surface equals	331-ft. lift
10-in. pole at depth of	716 ft.	from surface equals	385-ft. lift
10-in. pole at depth of	1021 ft.	from surface equals	305-ft. lift
10-in. pole at depth of	1318 ft.	from surface equals	297-ft. lift
8-in. pole at depth of	1618 ft.	from surface equals	300-ft. lift
6-in. bucket at	1650 ft.	from surface equals	32-ft. lift
Total			1650 ft.

During the 37 years this engine has worked it has only had a new cast-iron condenser-chamber; the cylinder-liner is not now in first-class condition.

One more example will serve to show the Cornish pump as compared with a direct-acting steam-pump. Some three years ago it was decided to open an abandoned mine. The shaft was about 300 ft. deep, but the lower 200 ft. was caved. It was decided to put up a Cornish pumping-engine, but I wished to push ahead with the work while the engine was being erected. This engine had a 36 in. by 8 ft. cylinder. A well known type of American direct-acting sinking-pump, 14 by 6 by 12 in., was put in the shaft and operated by steam from the new Sandycroft Cornish boilers that were eventually to run the Cornish engine. The country rock was decomposed granite, so there was a lot of sand, and conditions were not favorable for pumping. That sinking-pump was running for about nine months, that is to say, it was running when it was not being repaired, or the sand being cleaned out of the valve-chambers. Some progress was made with the clearing and sinking of the shaft during the intervals, and the pump used up three tons of coal every 24 hr. In the end it wore itself out pretty badly; it also wore out the patience of the pit-men and mechanics, so that you can't talk steam pumps to them any more. When the Cornish pump started up with a 10-in. pole at the 300-ft. level, and a bucket lift for sinking, it quietly handled the water and sand at two strokes per minute, and the coal consumption went down from 3 tons to 16 cwt. per 24 hr. The shaft-sinking was completed to the 550-ft. level and driving started. The water soon doubled and trebled on us. The Cornish pump got up its gait to 7½ strokes per minute, and kept it up for 18 months with hardly a stop, and as the surrounding country was drained the water gradually fell off. Now the pump is going at a comfortable 4¼ strokes per minute, and if the mine will only hold out it will continue to do so for another half-century. I have often wondered how we should have got on through that time had we been dependent upon steam-pumps. Probably the company would have been broken, and it would not have been the first mining company that steam-pumps have broken. I am beginning to think that I shall be charged with being a champion of Cornish pumps, and as you know, I am not a Cornishman, nor have I ever set foot in Cornwall. What is the alternative? Steam pumps underground are out of the question; compressed air is too expensive; a big electric installation is more expensive in first cost than its equivalent in Cornish pumps. Given a good hydro-electric supply-station, and a decent rate for the electric horse-power, there is no doubt much to be said in favor of the high-lift centrifugal pump. I believe the three-throw geared-pumps, electrically operated, are not an unqualified success. In any electric installation of pumps there must crop up the sinking problem. I doubt whether this has been satisfactorily solved by electric pumps. It must not be forgotten that reliability is economy in mine-pumps. I am not ashamed to admit, as some apparently are, that I am a champion of the Cornish system of pumping wherever the conditions are at all favorable for it.

ERNEST P. WOAKES.

Linares, Spain, May 26.

Foothill Copper Belt of the Sierra Nevada.

The Editor:

Sir—In your issue of May 2 I find a criticism by O. H. Hershey of my paper the title of which appears above. I fear that Mr. Hershey in his proper scientific zeal, which I sincerely admire, has jumped with rather too much force. My short paper, in frank avowal, was merely a preliminary study, the conclusions drawn being based only upon facts observed in certain portions of the belt. Furthermore, to forestall the kind of criticism made by Mr. Hershey, I stated in the beginning, "In fact, the information concerning the belt under discussion is yet so slight that it is impossible to formulate any broad generalizations. Whether or not the belt possesses unity as a province of any class, metallographic, petrographic, or structural, is yet to be settled." I fondly labored under the belief that my position was thus made clear, but evidently my hopes were vain. The object of a preliminary study, such as my paper was, is two-fold. It must attempt to correlate known facts sufficiently to make possible a few definite, even if temporary, conclusions. Also it should be so written that more description by others on the same subject shall follow. The copper belt of California has long lacked such description; if Mr. Hershey and others will give us what facts they possess, our knowledge will rapidly increase. From this point of view also I appreciate the expression of Mr. Hershey's opinion.

I think it is obvious that every mine, whether in a region of fixed well known characteristics, or in one of great variability, must always be examined on its own merits. General or preliminary descriptions of mining regions are of use only as such, and no right-thinking man would be guilty of drawing final conclusions for a particular mine from them. Their purpose is to awaken interest and lead to a gain in knowledge. Hence it appears to me the "pernicious" effects of my conclusions, drawn under limitations clearly stated, do not materialize.

But it may harm nothing to glance for a moment at a few facts. Mr. Hershey would have considerable secondary sulphides northwest of Copperopolis. Calaveras and the more northern counties have produced considerable copper since the initiation of the industry, but the primary ore has been the important

one. True, rich surface ores were worked, even at Copperopolis, but these did not last long, and the various holes and prospects all along this portion of the belt show chalcopyrite near the surface, at times actually outcropping. Exception will probably be found; it would be strange otherwise. The Copperopolis deposit is unique in some of its features, but I cannot regard it as wholly so. The type of deposit is natural for the soft schists of the belt, and with no peculiar structural conditions I see no reason to so regard the deposit itself. The ore I have examined from the Cavan mine, in Mariposa county, from the 100-ft. level, was composed of seams of chalcopyrite in schist, not greatly dissimilar to the Copperopolis ore. In the group of mines near the well-known White Rock, in Mariposa county, including the Pocahontas, the original sulphides are near the surface, except at the Pocahontas itself, which has peculiar local structural conditions. But even here, with roughly a 100-ft. zone of secondary change, bottomed by rich secondary sulphides, the mine is to be made or unmade by the unaltered sulphides below. This indicates that it is wise to get the other fellow's point of view. There are hundreds of prospects north and south of Copperopolis along the belt, for the most part consisting of shallow holes and pits. There are the deeper mines as well. That much secondary sulphide ore exists southeast of Copperopolis cannot be doubted, from Mr. Hershey's descriptions. But I believe that most of these properties depend for value as mines upon the primary ore; the secondary ore may be rich, but gives out too soon. The Green Mountain mine, in Mariposa county, appears to be a good example. It was in this particular sense I used the word ore in the statement disliked so by Mr. Hershey, even limited as I was in my area of examination. I believed that this meaning was evident after my description of all the ore that I had handled, secondary and original.

As a matter of further note, every one of the conclusions drawn in my paper are as open to the criticism made by Mr. Hershey as the one chosen. But the facts were limited, as was clearly evident. Logically, therefore, the conclusion drawn must be regarded in the same light. They hold only for the area described, "from the facts presented in this paper." My mode of expression, in a desire for brevity, may have been somewhat abrupt, and if so, I willingly admit my fault. But even this, I believe, cannot alter the main conditions under which I wrote.

Mr. Hershey makes much of decrease of copper content with depth in the southern mines, accounting for this entirely by secondary sulphide-enrichment. While in no sense questioning his observations on chalcocite and other minerals, I can state definitely that at a number of mines south of Tuolumne county, the names of which I am not at liberty to divulge, the primary sulphide ore slowly changes with depth, the grade becoming poorer. There is yet a vast field for investigation concerning the vertical order of mineral deposition.

I think our misunderstanding indicates that we need more knowledge. Contribution to information was surely my aim in writing the paper under discussion. Lastly, I must protest against the intimation that my paper was based upon the examination of but one deposit. My legs often informed me that there probably were nearer three.

JOHN A. REID.

Triunfo, Baja California, May 26.

Cyanidation of Ore Containing Both Coarse and Fine Gold.

The Editor:

Sir—W. A. Caldecott, in his letter on 'Cyanidation of Ore Containing Both Coarse and Fine Gold,' published in your issue of May 30, quotes from an old article by C. H. Aaron (which, by the way, I have never seen) in which the latter advises millmen having trouble with their plates to place bars of iron on them, with the idea probably of forming a galvanic couple, thus making the plate more active as an amalgamator. On trying this combination, and using ordinary water as the electrolyte, I find that there is a feeble current of about 0.04 volt flowing in the solution from the iron to the amalgamated plate. Should the water contain any free acid, or soluble acid sulphate, a stronger current would, of course, be produced.

Later on he advises the use of a dilute solution of KCN in the mortar, apparently forgetting that this will reverse the direction of the current in his couple, and give a comparatively strong one (0.4 volt) from the plate to the iron, thus dissolving the plate instead of protecting it. It may be that it was not intended to use the iron bars in this case, but even so there would, of course, be some solvent action on the plate. His suggestion of using zinc or cadmium amalgam is simply a substitution of these metals for the sodium in sodium amalgam, the use of the latter in amalgamation being, I believe, first proposed by Sir W. Crookes. The zinc or cadmium would be less costly than the sodium, but would probably be less effective. The method proposed in my letter of January 18, using zinc strips, would result in forming a certain amount of zinc amalgam, and perhaps would help the amalgamation to some extent.

There is a slight typographical error in my former letter as printed. On the third line from the bottom of the page, the line, "The couple ZnCuHg (amalgamated plate)", should be: The couple Zn ——> CuHg (amalgamated plate). The arrow separating the electrodes and showing the direction of the current was also omitted.

JAS. S. C. WELLS.

New York, June 25.

Weights of gases, as recenetly determined by M. Guye, in gram per litre are:

Oxygen	1.42900	Nitrous oxide	1.9777
Hydrogen	0.08987	Hydrogen chloride	1.6398
Nitrogen	1,2507	Ammonia	0.7708
Carbon monoxide	1.2504	Sulphurous oxide	2.9266
Carbon dioxide	1.9768	Air	1.2928
Nitric oxide	1.3402		

GOLDFIELD, NEVADA.—VII.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Goldfield has squandered its gold. The proportion of profit that has reached the owners of the mines has been pitifully small. Thus, the Florence has probably yielded $4,000,000 worth of ore, and yet the shareholders have received only $210,000 in dividends, that is, about 5%. There is $350,000 in the treasury. Of course, the lessees have made fortunes, the miners have stolen fully half a million dollars, and the remainder has gone to the smelters and railroads. But a net profit of 5% on ore averaging over $200 per ton is a miserable result from an economic standpoint. The big group of the Goldfield Consolidated produced fully $6,250,000 gross in 1907, and out of this the shareholders have had two 10-cent dividends, making $710,000, although the profits to the company were $1,760,358. The lessees made about $2,000,000 and the miners stole fully $1,000,000—figures that made the dividends look small enough. The Consolidated group has produced $16,500,000 to date, in 4½ years. Mention may also be made of the Tonopah mine, which has produced fully $17,500,000, and yet the total dividends to date aggregate only $3,450,000, about one-third of which was derived from the Tonopah-Goldfield railroad. Of course, a 100-stamp mill has been built at a cost of $900,000, and a power plant for $250,000, and a branch railroad, and improvements of many kinds; nevertheless it is astonishing to note how little benefit the shareholders have derived from this bonanza. If we add the production of the three mines (the Florence, Goldfield Con., and Tonopah) since their incorporation, we get a total gross yield (not including ore stolen) of fully $38,000,000, out of which lordly sum only a driblet of $4,370,000 has reached the shareholders. It is disgraceful, and constitutes a striking contrast with Cobalt, another boom camp where men went wild, where transportation facilities were no better than in Nevada, and where even the Government hindered rather than facilitated development. Added to these difficulties were those of a hostile climate, the long semi-arctic winters impeding the efficiency of labor far more than the burning summer heat in the dry air of the desert. The ore has yielded massive native silver, easy to steal. No effort has been made to treat the output from the mines by local reduction works until recently, so that the railroads and smelters enjoyed full opportunity to reap an excessive harvest. Yet from a total production of $6,000,000 per annum for four years it is estimated that over 60 per cent has come into the mine-owners' pockets as profit. In 1907 the Nipissing mine yielded a gross return of $1,245,819, from which a net profit of $923,788 was realized, a result that is without parallel among the phenomenal gold mines of the Nevada camps. Indeed, the record of waste and loss was less startling at Guanajuato and Pachuca in the old bonanza days of the eighteenth century than at Goldfield and Tonopah in the twentieth.

Where did so much money go? As already indicated, many lessees made fortunes while operating under royalties ranging usually from 20 to 25% on the smelter returns; much ore was stolen and divided among the criminal class; a large fraction went to the railroads and smelters under cover of rates that were, in effect legalized robbery.

Until September 1907 the smelters charged:

On ore assaying:	Deduction for treatment.	Price paid for gold.
Up to $70	$6.00	$19.00
Between $70 and $100	7.00	19.00
Between $100 and $300	8.00	19.50
Over $300	9.00	19.75

An ounce of gold is worth $20.67, so the deduction when paying $19 per ounce on a 5-oz. ore is not less than $8.35 per ton, that is, the real smelting charge is double that stated. The cost of smelting on a neutral basis is about $4 per ton. As the smelters to which the Goldfield ore was sent are at Selby (near San Francisco) and Garfield (near Salt Lake), the distance it was transported ranged from 500 to 750 miles. The same rates were charged to both points. They were scaled according to the assay-value of the ore, thus:

Assay.	Per ton.
Up to $40	$ 7.80
$40 to 50	10.95
50 to 60	11.55
60 to 70	12.90
70 to 80	14.25
80 to 90	15.60
90 to 100	17.15
100 to 150	18.05
150 to 200	18.85
200 to 250	19.90
250 to 300	20.90

The freight-rate is adjusted on the basis of the sampling at the smelter. Above $300 the railroad charged $20.90 per ton, plus 4% on all valuations above $300. Thus on $500 ore, the rate was 4% of 200 or $8 plus $20.90, making the total charge for transport not less than $28.90, that is, an ounce and a half of gold at the smelter valuation of that metal. The 4% extra was made up from two charges of 2%, the branch road to Mina levying an extra toll of 2% on ore above $300 valuation, while the main road from Mina to the smelter levied 2% more. This double charge ceased when the two railroad systems were consolidated, so that the extra rate is now 2% only—but that is enough.

In October the money market was disorganized, the smelters were unable to carry large supplies of ore, they became over-stocked, and levied rates that were frankly prohibitory. It is fair to add that owing to the congestion of traffic on the railroads, the smelting companies were hindered in getting cash, for the bullion was so delayed in transmission that realization on ore purchased from the mines was postponed an extra 30 days. The freight and smelter rates became:

Assay-value.	Freight and treatment.
Up to $30	$18.90
$30 to 50	24.50
50 to 75	33.00
75 to 100	37.00

Besides, of course, the indirect deduction made

by paying less than the mint price of gold. Thus on $100 ore, the total exaction became $45.35. It reminds one of the early days—50 years ago—when smelting was beginning and everything was carried across the plains in ox-wagons. In the days when it was necessary to encourage better transportation, the payment of bonuses for such a service was well enough, but now the railroads take no extraordinary risks and are entitled to no extraordinary tribute.

On December 12 the freight rates were reduced, thus:

Assay.	Per ton.
Up to $20	$ 6.00
$20 to 30	7.10
30 to 40	7.80
40 to 50	10.00
50 to 60	11.00
60 to 70	12.00
70 to 80	13.00
80 to 90	14.00
90 to 100	15.00
100 to 150	16.50
150 to 200	18.00
200 to 250	19.50
250 to 300	20.90

The addition of 2% on any excess valuation above $300 remained as heretofore. It will be noted that the improvement in rates is on the lower-grade ore. And it is to be remarked that this arbitrary charge of an extra 2% on ore worth more than $300 is not accompanied by any liability on the part of the railroad company, which refuses to hold itself liable for a valuation in excess of $100 per ton, unless compelled by means of litigation. Even if the shipper is willing to release the railroad company from any extraordinary liability on excessively rich ore, this arbitrary charge of an extra 2% is made. It is the unblushing application of the principle of charging "all that the traffic will bear."

On February 6, 1908, the smelter rates were reduced, thus:

On ore assaying:	Deduction for treatment.	Price paid for gold.
Up to $50	$ 6.00	$19.00
$50 to 60	7.00	19.00
60 to 70	8.00	19.00
70 to 100	9.00	19.00
100 to 300	10.00	19.50
Over 300	10.00+	19.50

When the gold in the ore is in excess of 5 oz. per ton, an extra charge of 50 cents per ton for each additional ounce is made, so that on 7½ oz. ore, the extra charge is $2.50, making the total direct charge for smelting $12.50, to which the deduction from the mint value of gold must be added, namely $8.77, making the total exaction not less than $21.27 per ton.

To these smelter and railroad charges must be added the cost of sampling, which is $1.50 to $2 per ton, according to tonnage. Last year it was $2 to $3 per ton. The Western Ore Purchasing Co. and the Nevada Goldfield Reduction Co. have sampling works and receive ore, both as buyers and as brokers for the smelters.

It is no wonder that metallurgical ingenuity has been busily occupied in trying to find a cheap method of treating the ore on the spot, so as to escape these impositions from the railroads and smelters. The real benefactor of Goldfield and Tonopah has been the metallurgist who has devised an effective method of applying the cyanide process to the ores of these districts. I do not say that the railroad did not help to stimulate development or that the smelter did not help in marketing the ore, but of both it is fair to say that they have "the fault of the Dutch, of giving too little and asking too much."

Now that mills have been built and others are in process of rapid erection, the smelting and railroad rates will tumble. At Millers, a junction point on the railroad 42 miles from Goldfield and 31 miles from Tonopah, there are two large mills which treat the ores of the Tonopah and Belmont mines. The Montana-Tonopah has its own mill at Tonopah. At Goldfield, the Consolidated Co. will have the Combination mill and its new 100-stamp mill, to be completed by November. Besides these are the custom plants of the Nevada Goldfield Reduction Co. and the Goldfield Cl Mill Co. Escape from the grasping hands of the railroad and smelter is assured.

With this prospect of competition, the railroad is likely to reduce its maximum rate to $12, keeping the minimum at $6, for the only ore to be sent out of the district will be the rich stuff. Smelter rates are likely to become $6 on ore under $50 and $8 on ore up to $100. It is likely that the $10 charge on ore assaying $100, and over, will be maintained, but the penalty of 2% on ore carrying more than 5 oz. gold is likely to be abolished. This is necessary if the smelting companies are to get the high-grade ore in competition with the mills. On ore above $300, the old penalty is likely to be maintained because the mills are not eager to treat this extra-rich ore. Such rules and exactions are what provoke men to wish for a benevolent despot or an interfering paternalism, to curb the frankly predatory instincts of corporate agencies. The smelting and the railroad corporations will come to an agreement as to how much each is to have. Just now the smelters are trying to get the railroad to reduce its tariff. When an adjustment has been made, it is probable that $50 ore (2½-oz. gold) will be the dividing line; ore richer than that going to the smelters, ore less than $50 going to the mills, and as the mines grow in size, milling methods improve, and competition between the mills develop, there will be a tendency to treat an increasing proportion of the output in Goldfield itself.

Some idea of the rate of production to be made from the Goldfield Consolidated mines is obtainable from the fact that the new mill will treat 600 tons per diem, in addition to the 80 tons now treated in the Combination mill. This output of 680 tons will average $30; with a recovery of 90%, this means $18,000 per day or about $5,500,000 per annum. In addition there will be 30 to 50 tons of ore daily, averaging $80 to $300 per ton, sent to the smelters. It will be economical to mix the high-grade stuff with that which will yield a small profit, for in milling as in smelting it is possible to improve results by suitable mixture of ores. Thus, by adding

a small quantity of very rich ore to the daily feed in the Combination mill, good results are obtained. Recently the old Reilly lease-workings were tapped on the 280-ft. level of the Combination and a streak was found there 15 inches wide assaying 40 oz. gold. By distributing a ton of this stuff over 24 hours of mill-feed, the tailing was not enriched unduly and yet a good extraction was obtained by amalgamation, while the value of the concentrate was increased. In this manner the company is enabled to ship concentrates only and avoid the extortionate charges of smelters and railroads. Mining costs are from $3 to $4.50 at the Combination. In the Consolidated group the average cost of mining, development, and general expenses should not exceed $4 per ton. Transport to the mill will cost 10 cents. The average milling cost is now $6.50; in the big mill it should be not more than $2.25 per ton. Thus the total operating cost should be under $6.50. This is doing well. Kalgoorlie got down to such low costs after 10 years, Goldfield will have done it in two, by reason of the benefit derived from the experience of other gold mining districts. Let us hope that the period of squandering, of gutting mines to enrich ore-thieves, gambling saloons, bunco-brokers, railroads, and smelters is past, and that the profit will go first to the shareholders, the owners of the mines, and then, but not until then, to all the others who are the indirect beneficiaries of successful mining operations.

Nevada-Goldfield Reduction Co's. Plant.

While the prolific production of gold has given point to the name of this Nevadan mining district, there is one feature of even greater interest to the engineer, namely, the conquering of natural obstacles. The creation of a hive of industry in a desert, by the construction of railways, the building of lines of power-transmission, and the bringing of water from a long distance—this is a fact to which every intelligent visitor must bow respectfully. It is part of the conquest of man over nature, the winning of the abomination of desolation where the sagebrush lifts an ashen face to an azure sky and barely hides the alkaline waste that was not ready for the habitation of man.

The electricity used for power and illumination at Goldfield comes from energy generated at the head of Bishop creek, in the mountains of the Sierra Nevada. The power-plant is in California, 95 miles west of Goldfield. The power is derived from the water issuing from a number of lakes, the highest of which is 9630 ft. above sea-level. There will be five power-houses eventually; at present three are built. Two of these (No. 4 and 5) generate 7500 kw., equivalent to 12,000 hp. During the present year the third plant will be completed, adding 8500 kw., or a total of 16,000 kw. One horse-power is equal to 746 watts. Both Pelton and Doble wheels are employed, the water being utilized five times over. The original transmission-line was made of aluminum wire, No. 0, B. & S., equivalent to 0.32486 inch. The second, or parallel lines, is made of copper, No. 00 wire, equivalent to 0.3648 inch. Mr. Delos A. Chappell, the president of the company (named the California & Nevada Power Co.), informed me that they were forced to take copper for their second line because of their inability to get aluminum promptly. The voltage is 55,000. The wires are strung so as to give the proper sag under varying temperature, so that the maximum stress equals one-quarter of the ultimate strength. Allowance is made for a minimum temperature of —20° F. The cost of power to the consumer ranges from $6.50 to $15 per hp.-month, as measured on the low voltage side of the consumer's static transformer by Westinghouse polyphase integrating watt-meters installed by the power company. This applies to large contracts; in small ones the measurement is by peak-load, taking 90% of the record.

The water supply of the town comes from the Goldfield Consolidated Water Co., which owns springs on Magruder Mtn., near Lida, 30 miles distant. A pipe-line was built in 1907, the water being delivered on October 4, 1907. The first pipe-line was defective, but the manufacturers made good, substituting new pipe. The actual cost of water is $1 per 1000 gal. when used in the mills of the district. This may be compared with the cost of water in Western Australia, where the Government built a reservoir and pipe-line 353 miles long, at a cost of $15,700,000, and delivers water at a maximum cost of $2.40 per 1000 gallons.

A brief description of the district as it appeared from a central elevation may prove of interest to those who have not been to Goldfield and it may prompt a contrast in years to come. Standing just outside the shaft-house of the Little Florence lease on one of the many hillocks rising above the desert, the view (on April 11, 1908) was as follows: To the west on a flat plain is the town of Goldfield, with a population of about 15,000. The multitudinous small dwellings, like matchboxes of varied color, are dominated by several large structures of brick and stone, among which are conspicuous the Court House, the new hotel, the School, the News building, the Casey hotel, and the Hippodrome. The last is not the Stock Exchange, as might be supposed, but a place for prize-fights and other diversions. Overlooking the town farther to the west is the edge of a 'malapai' (Spanish *mal*, bad, and *pais*, land)

terrace, a mesa capped by basalt and underlying tuffs. In the distance is the snow-covered crest of Montezuma mountain.

Southward the malapai swings across the horizon and is broken by low hills, surmounted by remnants of lava. In the middle distance are several shafts and head-frames: the Combination Extension, White Rock, and Portland. At the foot of the hill on which the observer stands is the Florence Extension.

Turning eastward the sky is cut by a red hill, of that name. The dumps and head-frames in the intervening flat, mark leases on Consolidated ground. Due east, there is a break in the ridge forming a pass through which the Clark railroad goes to Los Angeles and also the Brock railroad to Rhyolite. The nearer of the two tracks (which connects Tonopah to Rhyolite) appears to follow the wagon-road and has a steep gradient, over 4%. Beyond the railroads are a number of broken ridges with combs of silicified rhyolite. A sprinkling of dumps and head-frames indicates the position of the C. O. D., Kansas City, Atlanta, Gold Bar, and Cimarron mines.

Swinging northward, just across the nearer line of railroad, rises a large mass of black rock, the mineral possibilities of which are now being tested in the B. Fraction. Then the view includes a large number of mines just east of the main ore-channel; among these are the Jumbo, Cleremont, and Velvet. In the immediate foreground is the new Florence mill and nearly half a mile northwest the Combination mill; beyond the last is the Western Ore Purchasing Co.'s sampler and the works of the Nevada Goldfield Reduction Co., and the Goldfield Cl Mill. All these metallurgical establishments are in the

Montana-Tonopah Mill.

flat north of the town and punctuate the picture assertively.

Almost due north are the Consolidated mines, with the Mohawk shaft-house and those of the Red Top and Laguna. In the same direction farther away is the Kinkead mill and the Booth mine near the base of Columbia Mtn., a conical hill rising about 1000 ft. above the flat and dominating the view northward. On the west side of the mountain can be seen the grade of the new railroad to the Consolidated Co.'s new mill, now under construction, and below it is the old (that is oldest, for 5 years means 'old' in Nevada nowadays) town of Columbia.

Looking northwestward over the flat to the left of Columbia Mtn. is a wide desert plain of alkali and sagebrush and in the distance rises the mass of Lone Mtn. To the right of Columbia Mtn. and on the northeast horizon are the white peaks of the Toiyabe range and north of them is Jefferson peak of the Toquima range. Over the northerly edge of the base of Columbia Mtn. runs the yellow line of

The Goldfield Hotel.

the automobile road to Tonopah, the site of which is indicated by the Butler Buttes just east of a yellow hill named Gold Mtn. Between the Tonopah hills and Goldfield the desert stretches, a dreary waste, threaded by the road connecting the two mining districts, which are linked by a sequence of discovery and by the human history that has changed the waterless wilderness into a hive of industry. Overhead is a flawless sky, the vast expanse of hill and plain is bathed in brilliant sunlight and vibrant in an air as pure as the morning of Time.

Zinc-smelting in a blast-furnace has been commercially used in Sweden for some time. The blast is suppressed, and the requisite heat is obtained by the aid of an electric current instead of fuel. The furnace greatly resembles a cupola furnace for producing copper matte. It is mechanically charged at the mouth, and provided with a water-jacket. The rheophores are placed in the same position as the tuyeres of a blast-furnace. The liquid zinc is collected in a crucible, and a slag is formed, which, as in blast-furnaces, is tapped discontinuously. Such furnaces, producing 5500 tons of zinc yearly, have already been working for a few months at Leadville, Colo.; Valerdeña and Santa Barbara, Mexico. Construction and working of furnaces capable of producing 55,000 tons yearly is said to be feasible.—*Revue Scientifique.*

Colored wood is the subject of a recent patent by a Norwegian firm. Whole trunks of green trees are colored, the sap being pressed out and the dye injected in its place. It is claimed that wood treated by this process is more durable than ordinary wood, and that it will not warp.

THEORY OF THE SETTLEMENT OF SLIME.

Written for the MINING AND SCIENTIFIC PRESS
By H. S. NICHOLS.

Critical consideration of the factors affecting the settlement of slimes, is necessary to an appreciation of the relative degree of their importance. Taking the effect of an increase of temperature first, it has been suggested that the acceleration in settlement thus produced might be due to a corresponding decrease in the specific gravity. In this connection, however, pulp must not be confounded with liquid medium; for instance, it might be assumed that a corresponding effect would be produced by reducing the specific gravity of the pulp by the addition of water. The relative rates of settlement of a fine clay slime in pulps of varying density were found to be as represented by the plotted curves, Fig. 1. The specific gravity of a thin pulp may be reduced by an amount approximately 0.006 by raising the temperature from 60 to 100°F. This difference in specific gravity may also be brought about by reducing the

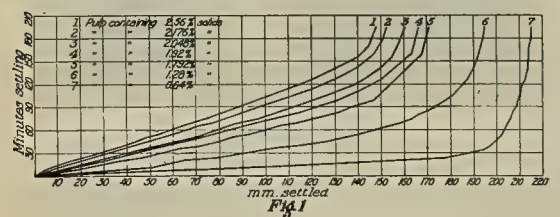


Fig. 1

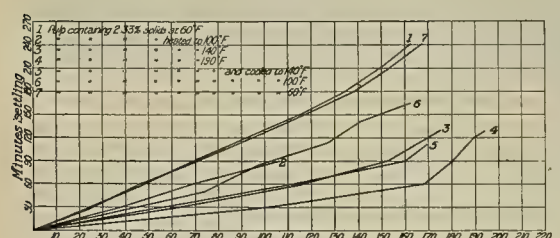


Fig. 2

solids in the pulp by 1%, or in other words, by adding water to a given pulp, and it will be seen that the thinner the pulp, the greater the amount of water to be so added.

The amount of water to be added might be calculated roughly from the formula: N=Y(99.4+N)—X. where N the number of units of water to be added,

Y the specific gravity of the pulp at 100°F.,

X the weight of 100 units of pulp at 100°F.

The effect on the specific gravity produced by diffusion is not to be compared with that produced by increase of temperature as affecting settlement, however, for the solid particles of a pulp cannot be considered as passing through the pulp beneath them.

Temperature and electrostatic conditions both are factors affecting the falling of solid particles in liquids, and both are to be considered in relation to the principle of free settlement. It may even be allowed that in the electrostatic condition is to be found the force which retards settlement, and it is clear that when particles are free to fall, the specific gravity of the liquid medium is of importance and the greater the accumulation of solid particles, the greater will be the operation of the electrostatic force, and the more will the effect of temperature be discounted. Before leaving this question of temperature, it was also considered in connection with the effect of occluded air. The settlement of solid particles may very well be retarded by clinging air blebs. Heating and agitation undoubtedly dissociate the occluded air. A series of tests was made, the results of which are plotted in Fig. 2. For the purpose of these and all following tests, a very fine clay slime was used, containing no free silica. This clay was taken by the courtesy of Mr. S. S. Fowler from a decomposed dike found in the Blue Bell mine in the West Kootenay district of British Columbia, and was practically clean silicate of aluminum.

A stoppered graduate was filled with pulp made

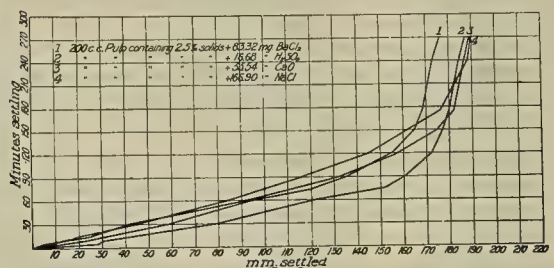


Fig. 3

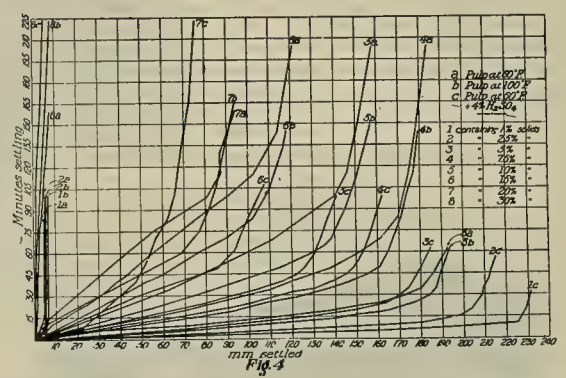


Fig. 4

from this slime, containing 2.33% solids, and allowed to settle at 60°F., care being taken to maintain a uniform temperature. The pulp was then raised in temperature to 100°F., and agitated so as to remove as much air as possible, the graduate being full, and the rate of settlement was again noted. The same steps were taken at 140 and at 190°F. The pulp was then allowed to cool down to 140, 100, and 60°F., and the settlement noted in each case. The plotted curves show the rate of settlement and it will be seen that in the descending series the results obtained were practically the same as in the ascending series. Thus the theory of occluded air affecting settlement to any marked extent was abandoned. Next the effect of the addition of different electrolytes was tested, with the results as plotted in Fig. 3, and sulphuric acid was adopted as being the most effective. Fig. 4 shows the plotted results obtained with pulps of varying density, first at 60°F., second at 100°F., and third, with the addition of 4% of sulphuric acid at 60°F. For these tests the clay slime was slightly roasted, as more definite readings were thus rendered possible. Fig. 5 and 6 show curves plotted from Fig.

4, showing the settlement in millimetre during 30 minutes and 60 minutes, respectively.

From the results shown in the several plotted curves, the following conclusions are deduced:

1. In thin pulps, temperature may be more potent than electrolytes.

2. In thicker pulps, the addition of electrolytes may be double the added rate of settlement produced by increase of temperature.

3. As pulps settle, the effect of the addition of electrolytes bears a more constant ratio to the state of density (see Fig. 6, curve 3).

4. In pulps containing higher than 15% of solid matter, the effect of both the addition of electrolytes

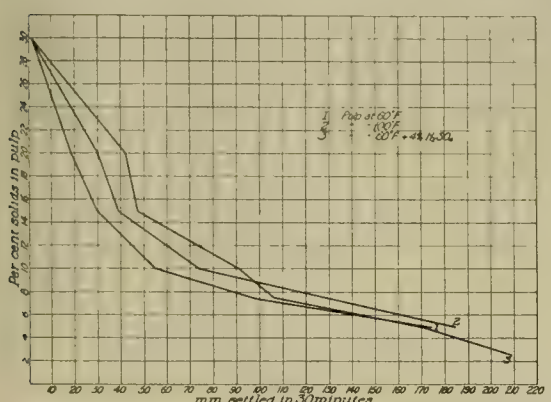


Fig. 5

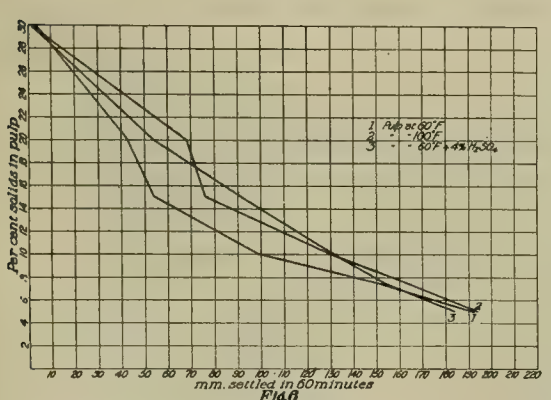


Fig. 6

and the increase of temperature becomes rapidly obscured.

These deductions are explained as follows:

1. In thin pulps, repulsion of particles and counteraction of gravity, due to the electrostatic condition, are reduced by diffusion, the particles being farther removed from one another, and therefore any cause affecting the relative densities of the solid and liquid constituents of the pulp would produce more marked effect than that affecting the electrostatic condition.

2. In thicker pulps any cause counteracting the repulsion due to the electrostatic condition would be more and more potent as the particles are crowded in closer proximity to one another.

3. The effect of the addition of electrolytes, being thus in relation to proximity of particles, would be more steadily affected as the pulp increases in density, and free-falling is interfered with, than would that of reduction of the specific gravity of the liquid medium.

4. The economic use of electrolytes is limited, and it may therefore be assumed that the addition of any electrolyte will produce an effect limited in degree, and as the repulsive force due to the electrostatic condition is rendered more operative by closer packing of the solid particles, such electrolyte will become inefficient and finally of no avail. This fact is further testified to as follows:

5. Increase of temperature always produces a more compact final settlement than addition of electrolytes, for in the final stage of packing, settlement is assisted, though very slowly, by the slightest variation in the densities of solid and liquid. The case may be diagrammatically represented as follows:

| | | |

and the initial or maximum velocity of the falling solid particles should be approximated to. Fig. 7 gives the plotted results obtained with a small model, a modification of my apparatus for slime settling, in which the settling chamber was made with straight sides, into one of which a glass window was inserted.

The straight line indicating free settlement shows that not only is the retardation, so clearly evidenced in the other curves, entirely done away with, but the velocity of falling of the solid particles was, even in the case of the thickest pulp experimented with, similar to the initial velocity obtained with the thinnest pulp.

Fig. 8 shows a comparison obtained with an addition of 2% sulphuric acid and with adoption of free settlement in a pulp containing 2.56% of raw clay slime.

Previous agitation, temperature, and diffusion, or state of density make great difference in settlement in the same material. With the fine clay slime used in these tests, a pulp containing less than 1% of solids would not be clear for several days alone, but with the addition of an electrolyte settled almost at once. Again, a pulp of 2.5% solids, which settled as shown (see Fig. 8, curve 1) under normal conditions, after being heated to 200°F. and violently agitated, showed no signs of settling after 48 hours.

DEFINITIONS OF IGNEOUS ROCKS.

The following brief definitions of the more common igneous rocks, all of which are encountered throughout the desert region of the Southwest, will be interesting and useful. The definitions are those having the approval of the United States Geological Survey, and are prepared to meet the needs of the non-technical reader.

Alaskite is a granular rock of white or light-gray color. It is composed almost entirely of quartz and orthoclase.[1] It is a granite lacking mica and hornblende.

Andesite is a porphyritic rock; that is, it has visible crystals (phenocrysts) embedded in a finer-grained, often glassy groundmass. The most conspicuous features are the phenocrysts of hornblende or biotite, or augite and plagioclase.

Aplite is the name applied to a finely granular rock which usually occurs in dikes cutting, for example, a granite. The aplite, which as a rule is more silicious than the granite, in many instances has solidified from a portion of the granite mass that is still liquid at great depths.

Basalt is a black or dark-gray rock which is often porous from the presence of steam-holes. Crystals of olivine, plagioclase, and pyroxene may or may not be visible in the dense or finely granular groundmass.

Dacite may be briefly defined as a quartz-bearing andesite. The more basic dacites closely resemble andesites, while silicious dacites are closely connected by transition rocks to rhyolite and might be confused with rhyolite were it not for the presence of plagioclase crystals.

[1] Orthoclase (alkali feldspar) is unstriated; plagioclase (soda-lime feldspar) is striated, and when light strikes it, alternate tiny parallel bands reflect the light simultaneously.

Diorite is a gray granular rock which is composed essentially of plagioclase and hornblende, while biotite or augite may also be present. Diorite and andesite are similar chemically, but differ texturally.

Diorite porphyry is a rock of the composition of diorite with abundant crystals of plagioclase, hornblende, and biotite. The groundmass is finely granular.

Granite is a granular rock of pink or gray color. It is composed of orthoclase, quartz, and either muscovite, biotite, or hornblende.

Granite porphyrite is a rock of porphyritic habit having the same composition as granite. Quartz and orthoclase are the more common phenocrysts, and these are embedded in a finely granular groundmass.

Latite is a porphyritic rock with more or less glassy groundmass. Phenocrysts of orthoclase and plagioclase are present in equal amounts, while either hornblende, augite, biotite, or olivine is usually also present. Chemically, latite is the equivalent of monzonite.

Monzonite is a granular rock resembling both granite and diorite, but containing orthoclase and plagioclase in approximately equal amounts. If quartz is present, the rock is called a quartz monzonite. It is usually of a gray color.

Monzonite porphyry bears the same relation to monzonite as granite porphyry to granite.

Pegmatite is here applied to a coarsely crystalline rock which occurs as dikes in some other rock—granite, for example—with which it practically coincides in composition. Such rocks are probably formed by segregations from the original molten mass of the inclosing igneous rock.

Rhyolite is a porphyritic rock with glassy base. It has the same chemical composition as granite. The most abundant phenocrysts are orthoclase and quartz, although biotite, augite, and hornblende also occur.

Syenite is a granular rock usually of gray color. The component minerals are orthoclase and hornblende or mica. If quartz is present, the rock is called a quartz syenite, and with increase in this constituent quartz syenite passes into granite. Where the component minerals are rich in soda, the rock is a soda syenite.

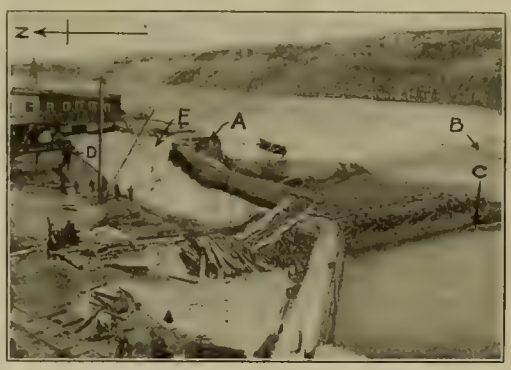
A high rate of progress was attained in the headings of the Loetschberg tunnel, Switzerland, during April, 1908. The advance of the south heading during that month (28 working days) is within 5% of the record established in the Simplon tunnel, when 685.5 ft. was driven in a single heading in one month. The Loetschberg figures for April are 656 ft. for the north heading and 521½ ft. for the south heading, a total of 1178½ ft. The two headings have now penetrated, respectively, 6986 ft. and 5658 ft. into the mountain, a total of 12,644 ft.—*Engineering News.*

Creosoting 'old-field' pine, the loblolly pine of the Southern States, imparts to it a strength which is equal to that of ordinary oak or hickory. Other inferior woods are benefited in the same way, and the range of relatively inexpensive mine-timbers is thus greatly widened.

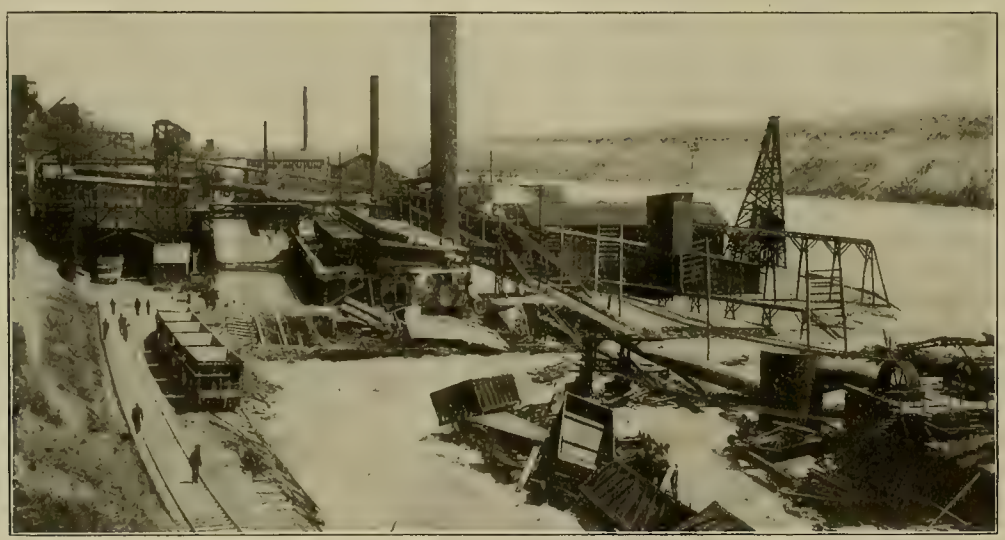
FLOOD DAMAGE AT THE GREAT FALLS SMELTER, MONTANA.

Written for the MINING AND SCIENTIFIC PRESS
By F. S. SHEWELL.

The Missouri and the Sun river valleys, in Montana were subjected to severe floods from unprecedented rainfall during the last week of May and the first week of June. The official observations show a precipitation of 5.3 in. on June 3, 4, and 5. Preceded by heavy snows in the Rocky Mountains, at the headwaters of the Missouri, and followed by a cloud-burst on June 5, the Missouri river at Great Falls rose nearly 5 ft. above its previous high-water mark. The water overflowed the race-walls at the power-house of the Boston & Montana Co.'s smelter, completely submerging them, and subjecting them to pressure-head of 3¼ ft. above that for which they had been calculated. Owing to this fact, and to poor masonry construction, the north wall failed by sliding. On June 1, at 3 A.M., the power-house was developing 9635 hp. from 15 Victor turbines, ranging from 20 to 57 in. diam. This power was transmitted partly in the form of compressed air, partly by wire-rope drive, and partly as electric current. The accompanying view, looking down the railroad track, shows the east end of the power-plant, with the rope-drive and the air-mains, after the power-plant had been wrecked by the flood. The view of the river and walls shows at D where the north wall failed, causing the destruction of the power-plant. At E the south wall was dynamited to divert a part of the water back to the river. At C is a point where one of the three 17 by 23 ft. head-gates failed. The letter A refers to the north approach of the suspension bridge, and B to the centre pier of the suspension bridge, destroyed at 9 A.M., June 8. In an effort to break the force of the current after the failure of the north head-race wall and the south gate, Superintendent Wheeler ordered four steel gondola cars, such as are used for hauling slime, to be dumped in between the north bank and the power-house. It is interesting to note that these had no more effect than so many toothpicks, and that in spite of the fact of the high specific gravity of their material, they bobbed around like corks in the whirlpool of the seething waters. The entire earth-fill down to the sandstone bedrock was undermined and washed out to a distance of 780 ft. from the front of the gate-house, to a point where the water found natural egress into the tail-race. The auxiliary steam-plant was saved. The dam, the gates, and the first units of the power-house were completed January 6, 1901. The total cost of the dam was $175,000. The crest was 14 ft. above the sandstone ledge, giving an effective head of 40 ft. The minimum flow was 4000 cu. ft. per sec., and at 3360 cu. ft. per sec., 16,583 hp., or 12,287 net available horse-power. Of this, the Boston & Montana developed for their first unit 2600 hp., and for the electric light plant on the south side of the river 1100 hp. The total cost of power developed, including all charges and depreciation, was $49.19 per hp. per annum.



Flood Damage to Great Falls Power Plant.



Ruined Power Plant of Boston & Montana Smelter.

Actual operation has since shown that the maximum horse-power available at low water (December, January, and February) is less than 5000. Of this

quantity the smelter produces less than 3000, and the light and power plant produces less than 2000.

On June 19 the water was finally shut off, through the construction of a steel skeleton gate, designed by the company's master mechanic, J. H. Klepinger. This gate was constructed of 12-in. lightest section I-beams and channels, with an average spacing of 16 in., and a 17-ft. span. The idea in constructing a skeleton gate was to offer the least possible resistance to the water pressure while sinking. The gate dropped 11 out of the 23 ft. by its own weight, 4 more by weighting, and the balance by jacking. Finally 4-in. sheet-piling was driven parallel to the gate on the up-stream side, which effectually stopped the flow and the further destruction of the plant.

To properly re-construct the gates, gate-house, head-race, penstock, and power-plant will cost close to $500,000. At the time of the shut-down the plant was producing 120 tons of copper and 2100 lb. silver per day. The company's cost-sheets show a total production cost of 10.1c. per lb. for copper. Dependent upon the price of copper and silver for the coming three months, the total gross loss to the Amalgamated Co. will apparently foot up to about five million dollars.

A CAUSE OF MISLEADING AIR-ANALYSIS.

On a warm day with the laboratory temperature at 72°F., and the vapor pressure of water as high as 20 mm. of mercury, a serious error may result in the readings of gas-volumetric apparatus. Vapor pressure of 20 mm. says James Moir in a communication to the Chemical & Metallurgical Society of South Africa corresponds at this altitude (about 4000 ft.) to 3.23% of water-vapor in the air; consequently in analyzing air over water the oxygen percentage of the dry air is apparently depressed by 0.7%; while the difference (reported as nitrogen) is affected by two errors, namely, the above 0.7% and in addition the actual quantity of water-vapor present. Thus a sample of air containing when dried 20.95% oxygen, 0.05% CO_2, and 79.0% nitrogen when introduced into an Orsat at 72°F., will expand by 3.33%; and the analysis will give $CO_2 = 0.05\%$, $O = 20.25\%$, residue $= 79.7\%$. Seeing such an analysis, one would suppose that some of the oxygen had been used up, but in fact the apparent deficit is due entirely to dilution with water-vapor. Again, 3.2% of the residue is water-vapor, so that the true value of the inert gases (mainly nitrogen) in the saturated sample is 76.5%; the depression from 79.0% corresponding exactly with the dilution of the dry gas with 3.33% of water-vapor. Consequently, to get comparable results with such apparatus, it is necessary to recalculate the observed readings. It would be more correct theoretically to use in the calculation the actual percentage of water-vapor present at the time of sampling; but in practice it is usual to calculate back to dry air, so as to be able to compare directly with the existing standard analyses of fresh air. Thus if the observed readings are: $CO_2 = 0.1$, $O_2 = 20.2$, residue $= 79.7$, and the temperature of the water is 70°F., the barometer reading 620 mm., that is, vapor pressure $= 18.6$ mm., then percentage of water-vapor is $(\frac{18.6}{620}) \times 100 = 3.0\%$. Consequently 100 c.c. of the wet gas contains $CO_2 = 0.1$ c.c., $O_2 = 20.2$ c.c., N_2, etc. $= 76.7$ c.c., $H_2O = 30$ c.c.; which quantities are also contained in 97 c.c. of the dry gas; therefore the true analysis of the dry gas is (multiplying the figure by $\frac{100}{97}$), $CO_2 = 0.103\%$, $O_2 = 20.825\%$, and N_2, etc. $= 79.072$ per cent.

An example of such a fallacy is the deficiency of oxygen always observed in mine air. The atmosphere in mines is usually near saturation, and consequently dry air entering the downcast with, let us say, 21% oxygen, will through mere dilution with water-vapor contain only about 20.5% by the time it reaches the foot of the shaft. In spite of this elementary fact, many scientists have attributed the fall in oxygen to such things as the oxidation of pyrite or timber. It should also be noted that the state of humidity of the air also affects the results of CO_2 determinations by Pettenkofer's method, but only to a slight extent. The observed barometric pressure should be diminished by the existing vapor tension at the time of sampling.

MORTAR.

When quick-lime is being slaked it must be kept wet. In addition to wetting it by addition of water from a hose, it is proper to have standing a barrel full of water, so that this can be dashed by the pail-ful upon the lime as it is crumbling. Lime loses strength if allowed to 'burn'. Though the practice is frequently disregarded, the making of lime-mortar should begin two or three weeks before it is used. It is more expensive to do this than to make the mortar and to use it as made. To make up mortar and have it standing causes extra handling and greater labor in 'tempering', so that the temptation is to adopt the other and easier way. Lime-mortar must be tempered until all the white spots or specks disappear, otherwise the spots, which are the unslaked part of the lime, will eventually swell and break the initial set of the mortar after the bricks are laid. Hence the necessity for curing it the length of time above specified. When it is proposed to make cement-lime-mortar, do not add the cement to the slaking lime-mortar. Cement must be thoroughly mixed dry with sand before it is added to the already-made lime-mortar, and this addition is to be made just before the mortar is used. Cement-lime-mortar when setting forms microscopic inter-locking crystals, and these crystals if broken, will never properly re-unite. If then the mortar be allowed to stand a while and is then used, this initial set is broken and the mortar is permanently weakened. Granting that the mortar has been properly laid, there is a further chance of damage if the work is allowed to dry out rapidly, and numerous instances could be cited of unsatisfactory work from this cause. When putting in concrete, thoroughly wet the forms in which it is moulded, or else grease them so that they will not soak up water from the concrete. Also wet the ground thoroughly before laying concrete, and after putting it in do not allow even a dry plank to lie upon it for at least two days after work is finished.

COPPER SMELTING IN SIBERIA.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM A. HEYWOOD.

Copper smelting at the Spassky works, in the Akmolinsk district of Siberia, has been carried on for forty years. Two of the features of the Russian operations are remarkable, namely, smelting in brick blast-furnaces with soft coal fuel and the production of a slag very low in iron. The ore smelted is hauled 72 miles by camels or oxen to the smelter. Twenty-six miles in the other direction the company owns large coal mines of a fair quality of soft coal containing about 12% ash. The smelter is 560 miles from the nearest station on the Siberian railway. These long hauls are made at an astonishingly cheap freight, less than some of the railway rates in South Africa. Machinery is hauled the 560 miles for about $15 per ton. Ores are hauled the 72 miles from mine to smelter for about $3 per ton.

The following is a typical analysis of the ore:

	%
Fe	2.9
Al_2O_3	2.7
CaO	0.4
S	6.8
$BaSO_4$	27.3
SiO_2	40.3
Cu	16.4

More than an equal weight of limestone containing 51% CaO is added for flux and about a third of the charge consists of old rich slags. The ore is smelted in brick blast-furnaces 4 by 20 ft. at the tuyeres and in smaller ones 4 by 10 ft. The height from tuyeres to charge-floor is 5 ft. About 35% of soft coal is used. The furnaces run very slowly, producing matte containing 55% copper, some black copper, and at the same time very often a quantity of cast iron runs out with the matte.

The following is an average analysis of the slag during one month.

	%
SiO_2	45.5
Fe	3.6
CaO	35.1
BaO	6.6
Al_2O_3	8.2
Cu	0.18

I have never seen any record of a slag containing such a low percentage of iron produced in copper smelting. It is also remarkably clean, considering that rich matte and black copper were made; but this is due to the low specific gravity and slow running. Attempts were made to make a more fusible slag by adding an iron ore containing 68.6% Fe_2O_3, but the reducing action of the furnace is so strong that instead of going into the slag it was converted into cast iron. Movable fore-hearths were used; usually in one day they would become filled with copper and chilled slag and matte. Experiments were made with reverberatory furnaces and it was found that iron could be used for a flux and a better slag made.

The matte and black copper are treated in a small reverberatory furnace having circular hearths 7 ft. in diameter. The hearth and arch are both formed by beating ground quartz and clay in place over wooden forms. When the matte is melted, a current of air is blown on the surface until copper is produced. Black copper is refined in a similar furnace, producing refined copper of fair grade.

STEADY-PAY MEN.

For the purpose of retaining and having available good mechanics and other men in construction work, the 'Field system' makes provision for keeping them busy when the weather or other causes prevent carrying forward the work. The rules applying are:

1. All steady-pay men are to arrive on the job before the first whistle has sounded, and must remain there until quitting time, regardless of the weather. They must not hang around doing no work, but must be actually engaged upon needed work.

2. Foremen and time-keepers are to report to the engineer in charge, before starting and before quitting work.

3. Apprentices are subject to all the rules of steady-pay men. They are to be kept busy, and instructed in their work.

4. When work is stopped, owing to bad weather, if there is no other job for them, steady-pay men may do work upon jobs, which it may be useful to enumerate as suggestions to others, namely: Making trestles and horses for scaffolds, repairing wheelbarrows, repairing hods, mending hose, repairing engine-house or other buildings and lockers, putting handles on tampers, cleaning up tool-house, cleaning transits, preparing staging and runs, sharpening saws and tools, sawing handles off worthless shovels, checking up lines and levels, checking dimensions as of steel and iron, pipe, door and window frames, dimension-stone, and the like, brushing off or cleaning roofs, sills, or projections, so that rubbish will not be washed by the rain into the conductor-pipes, cleaning the sills and projections so that the mortar will not take stains from the rain, cutting stone for arches, cutting brick, branding and stamping tools, stacking lime and cement in a dry place 6 in. clear from the ground, and in such order that the oldest will come out first, packing cement bags for return, making needed tool-boxes for storing small tools, and so forth.

Every superintendent, engineer, and the men themselves, must suppress subscriptions for presents, and other forms of graft. All steady-pay employees, whether working or not, even in vacation, should keep the office notified of their addresses. Foremen are required to work in harmony with one another, and all steady-pay men get credit or blame according as the job is well or poorly conducted. The steady-pay men are working in the interest of the firm; therefore, their private character, and their conduct outside of working hours, is counted in considering promotions.

Windmills of the four-wing type having an area of 65 sq. ft. will in wind having a velocity of 13½ miles per hour (20 ft. per second) develop one horsepower.

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Written for the MINING AND SCIENTIFIC PRESS
By WALTER H. BUNCE.

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During the installation of the plant and pipe-line, work was carried on by hand-labor, the adit reaching a length of 263 ft., including the portal section of 115 ft., which was heavily timbered 7 by 7 ft. in the clear. Machine-drilling was then started and a run, which lasted for five full months, was made, only two rounds of holes being lost in that period.

This run of five months (152 days) resulted in driving the heading 7½ by 7½ ft. in the clear, a distance of 1712½ ft. in hard rock; a monthly average of 342½ ft. The best weekly record was 85 ft.; the best month (31 days) was 359 ft. But two 8-hour shifts per day were employed, economical considerations, not speed, being predominant always. Compressed air at about 100 lb. was supplied to a pair of 3⅛-in. New Ingersoll drills, both mounted on one single-screw column set horizontally above the muck-pile. The round, consisting of from 15 to 19 holes, was drilled—except the lifters—from this setting, the bar being re-set for the lifters after the muck was away. The 'cut' was taken from the bottom, uniformly. Three drill-men tended the two machines, drilling a full round each shift. An unusual system of 'mucking' was employed, which, perhaps more than any other one thing, may account for the substantial rate of progress that was reached and maintained. The tunnel track, 18-in. gauge, was carried close to one side of the adit, and a floor consisting of steel plates and planks was maintained with the greatest care for not less than 60 ft. back from the heading. This floor was moved forward every round. No switches or turnouts were used; cars measuring 20 cu. ft. capacity were specially designed and these, although weighing empty 1000 lb. apiece, were so perfectly balanced that the empty cars composing an incoming train were easily 'jumped' off the track onto this floor, the loaded cars passed by, and then the empties replaced on the track in detail as required by the muckers for loading. Muck was handled with No. 6 square-pointed shovels. Four shovelers and a mule-driver composed each shift. Track was laid and leveled by the muckers. Each shift, composed of drill-men and muckers, started work together. No ventilating system was installed, the smoke being blown back with air from the compressor. The adit throughout its entire length was perfectly dry.

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Pipe-line through tunnel is 3½-in. standard black pipe. Track is 16-lb. section, on ties laid 20 in. apart. Powder (40% dynamite) cost $0.1315 at the portal. Close estimation places its consumption at 14.5 lb. per foot for machine-driving. Steam coal cost $3 per ton at the boilers. The air-pressure was nominally 100 lb. and a recording gauge kept on the line proved of value in many ways. There was always plenty of air. No charge for depreciation of tools and equipment has yet been entered; renewals and repairs are made and charged currently to 'Tunnel Expense' and the actual value of the outfit to the company is about equivalent to new, as nothing has been allowed to run down.

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I would call your attention not to the technical, but to the human field before you. I do this because it is so often neglected by mining engineers, and because this neglect is apt to bring delay, disappointment, or failure. The special work of an engineer is to apply the discoveries and methods of science to the practical business of the world. Often he forgets how many-sided a man must be for this end, and absorbed in technical details he overlooks the fundamental requirements of life. I urge you therefore not to forget that the world is made up of things and of folks, and that nine-tenths of your business will be with folks. Science is a fascinating, but exacting goddess, and she brooks no rivals. She weaves a mystic spell about her devotees and normal human motives disappear. The love of gold, the dream of power, the hunger for social position, are forgotten. Scientists find themselves impelled by strange mysterious forces, unknown to the multitude, and by themselves but dimly understood. They pursue truth for truth's sake. They discover realities through the insatiable desire to know. Enthralled by the passion for exploration and discovery, they give profound intellectual effort, they expend lives of unsparing labor for a mere existence, often without the aid of recognition or of sympathy. Such men live apart and in a higher world. The enthusiasm kindled in the student's heart by the touch of the scientific spirit can never die out. It must always be the inspiration of the mining engineer. But his own life-work is sternly practical. It is the production of wealth from the forces and materials of nature. It leads out of the library and the laboratory into the busy world of men and affairs, and it calls for the well balanced man. This school has done what it could for your equipment. It has performed the duty for which it was created; it has awakened and developed your intellect; it has acquainted you with the methods and resources of science and of your profession. You represent the conscientious labor of earnest men who have brought you to a certain standard of mental and technical equipment. But your social equipment has been left to chance. The only common training has been that derived from your student life together for four years. This has knocked off the corners and rubbed down the rough places, and is one of the advantages of a college career. So, as you stand today, varying in personal qualities, I call your attention to the fact that henceforth you are your own architects, and can re-construct as you please. To youth all things are possible, and you can, if you wish it, change these qualities in any way you like.

The business world is not interested in the details of your education. It is understood that by the completion of such a course the man has made good in his first test. This gives promise for the future, and the fact of technical training assures ease in breaking a new man into the business. You will find that a diploma is of little interest to others, but a likeable personality is a passport good for life and in all countries. In time you are to discover that tact and diplomacy solve more problems than engineering formulae. That a memory for names and faces will help you more than one for minerals and rocks. Sooner or later you will know that good sense, that ability to decide which of any two things is the more important, is an asset beyond price. You will awake to the fact that valuable as is skill in the higher mathematics, it will never push you to the front like the ability to write a letter which will really do its work. How will you deal with people if not through language, that means by which your thought and will may reach the consciousness of others, that delicate and subtle medium necessary for the simple affairs of daily life, yet capable under a master's touch of swaying a multitude, of moving the world? How far have you learned its use? You have studied the reactions of chemistry, but how much have you learned of those subtle human reactions which break down indifference and create friendship?

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these journals stand foremost among the forces which are welding mining engineers into closer relations with each other and with the business interests which they serve.

The growth of professional unity and interdependence has also been fostered by the continued spread of the modern idea that an engineer has more to gain than to lose by exchanging technical information with others. He parts only with what a single man can know, he receives the knowledge of a thousand men. A profession becomes powerful and is able to second individual effort only in proportion to the growth of the fraternal and helpful spirit. It is the policy, as well as the duty, of every true engineer to recognize this and to use his best efforts toward that end. Throughout your career aid your profession, its schools, its associations, its journals, and its members; and for every hour, for every dollar, you give it, you will receive a hundred fold.

There are men who shut themselves up, and out of their inner consciousness evolve great inventions, or books. Occasionally a man will go into the wilderness and discover a mine. But such individual play has relatively small chances. The real business of the world is done by team-work, by innumerable bodies of men, each of which is under some kind of organization to combine its units into an efficient human machine. Every such machine, whether it be a base-ball nine, a section gang, the force of a great steel plant, a railway system, or an army, works with some irregularity. The individuals who compose it have human weaknesses, and the results are friction, loose-joints, lost motion, and sand in the gears. Nevertheless, the outfit goes creaking along, and usually gets there, often to its own surprise. There are weak points not only on the human, but also on the technical side of every business. Moreover, methods, processes, and machines are constantly changing. These conditions, the imperfection of technical methods and the faults of human organization, will provide your openings. It is because of them that the world is so full of opportunities for men who have the combination of sound technical training with good sense. When, therefore, you hold a job, do not waste time in complaints and fault-finding. You will continually see waste and loss, things which are wrong, things which need improvement. Others see them, too. If you have sense you will notice everything, but will keep quiet until the day when your advice will be asked. Some day you will be given charge of a piece of work, of a few men, and may then bring out your ideas by doing this work better and more cheaply than before. While you are in any business organization, be loyal to it, hold up the hands of those above you, and keep your own work as free as possible from the faults you notice elsewhere.

Throughout your career you will make errors and have occasional bad falls. Avoid the delusion that such occurrences are fatal, unless you fail to learn its lesson, and allow it to weaken your courage. Some of the most successful men I have known had failed so many times that they stopped remembering. Bear in mind the Arizona epitaph, "Life ain't in holding a good hand, but in playing a poor one well." Under normal conditions your status will long be simply that of the human animal struggling for the existence of self and family, differing from other animals only in its peculiar environment. The struggle for existence is your first duty, and may long demand your whole attention. But for those of you who respond to the spirit of the age, the time should come, by middle life if at all, when your eyes will be lifted from the details of self-seeking. You will suddenly become conscious of the great human organization of which you are a part, and of your relations to it. Thenceforth a part of the awakening soul of humanity you will see through the surface and into the injustice and unhappiness of the world around you.

Deposits of antimony on Coyote creek, in Garfield county, southern Utah, have been worked spasmodically since 1880, and it is reported that more than $100,000 worth of ore has been shipped from this region. The rise in the price of antimony in 1905-06 led to renewed activity, and 295 tons, part of which came from Utah, was mined in this country in 1906. Coyote creek, a branch of the east fork of Sevier river, occupies a short narrow valley in the northwestern part of Garfield county, in the high plateaus of Utah. The antimony camp is about 40 miles by road southeast of Marysvale, the terminus of the San Pete & Sevier branch of the Rio Grande Western railway, and stands at an elevation of about 7000 ft. above sea-level. The ore consists of stibnite and its oxidation products. In the early days attention was given chiefly to the lenses of ore, which carried between 50 and 60% of antimony. The known lenses have all been worked out. At present no large bodies of stibnite are in sight, but in the dumps of the old prospects and in the tunnels there is a great amount of low-grade ore. A large concentrating mill has recently been erected and it is proposed to make star metal on the property.

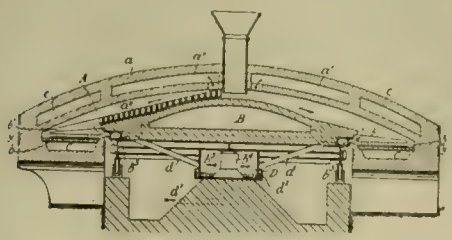
Diamonds in Arkansas constitute the subject of an article in the *Bulletin* of the American Institute of Mining Engineers by George F. Kunz, well known as the gem expert of Tiffany & Co. Up to date 140 diamonds, aggregating 200 carats, have been discovered, the largest weighing 6½ carats. All were associated with a peridotite intrusive, and one stone was found 12 ft. below the surface imbedded in the igneous rock, proving that this was the original matrix. Lithologically the rock is almost identical with the diamantiferous peridotite of South Africa. The igneous intrusive has come up through the Carboniferous and Cretaceous quartzites and sandstones, and there is no evidence of high temperature having accompanied the eruption, the adjacent sedimentary rocks showing no contact metamorphism. Further exploratory work is in progress.

Bessemer steel was first used in America by the Pennsylvania Railroad Co., in 1863. The steel was employed in making locomotive boilers, but proved to be too hard and brittle, having an elongation of only 7 to 10 per cent.

MINING AND METALLURGICAL PATENTS.

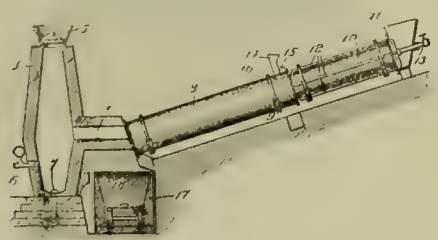
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ROTARY FURNACE APPLICABLE FOR USE IN ROASTING ORES OR THE LIKE.—No. 888,502. Woldemar Hommel, Lee, England.



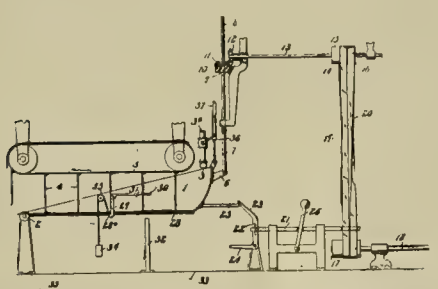
The herein described rotary furnace, applicable for use in roasting ores and the like, comprising an ore chamber, the floor or hearth of which consists of a rotary central portion, and a surrounding annular portion which is stationary; a series of obliquely set scrapers, arranged above the central portion of the hearth and adapted to work the ore gradually toward the periphery of the latter, and one or more scrapers, arranged above the annular portion of the hearth, attached to the central rotating portion and adapted to sweep the ore in a circumferential direction toward the outlet orifice in the floor of the stationary portion, the furnace gases being caused to circulate both above and below that portion, substantially as herein described.

METHOD OF TREATING COPPER ORES.—No. 890,563. John T. Jones, Iron Mountain, Michigan.



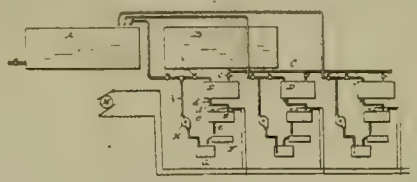
The method of treating ore containing copper and iron in non-metallic form to recover the copper, which consists in first subjecting the ore under reducing conditions to a temperature that will reduce metal producing constituents to a metallic state, and thereupon subjecting the reduced ore to a higher temperature sufficient to render fluid the copper constituent without melting the metallic iron constituent, and causing the said constituents to separate from each other.

APPARATUS FOR CONCENTRATING ORES.—No. 890,007. Ernest Wurdack, Baxter Springs, Kansas.



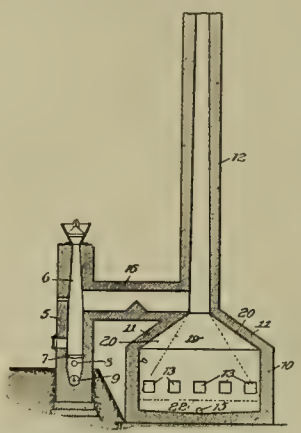
An apparatus for concentrating ores comprising a trough-shaped receptable pivotally connected at its front end to a support, means for introducing the ore into said receptacle, a member traveling through said receptacle for separating the metallic particles of the ore from the gangue, means for moving the rear end of said receptacle downwardly so that said traveling member will always have a level surface to operate on, and automatic means actuated by the downward movement of said receptacle for cutting off the supply of ore to the receptacle and for discharging the contents of the receptacle; substantially as described.

PROCESS OF RECOVERING COPPER FROM COPPER-BEARING SOLUTIONS.—No. 890,887. Luis Amenábar, Coquimbo, Chile.



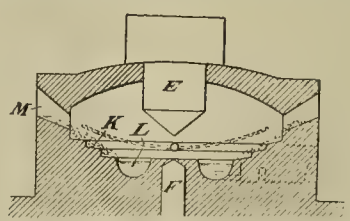
The process of recovering copper from a copper-bearing solution, which consists in subjecting the solution to the electrolytic action of a current of great density while in a circulating system in which the solution is brought into and removed from the field of electrolytic action a number of times.

ORE-SMELTING FURNACE.—No. 890,232. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minnesota.



In an ore-smelting furnace, the combination of a carbonaceous-fuel-burning furnace, an ore-stack, a chamber beneath and of greater cross-sectional dimensions than the stack, said chamber having a roof from which the stack rises and through which it discharges into the chamber, and a flue-forming neck leading from said fuel furnace, at a point about midway between its upper and lower ends, into said chamber and stack near their junction, for the purpose set forth.

FURNACE FOR METALLURGICAL AND SMELTING PURPOSES.—No. 889,431. Kristian Birkeland, Lysaker, near Christiania, Norway.



In an electric furnace, electrodes, means to produce an arc between the ends of the latter, a hearth adjacent the arc gap between the electrodes but not immediately below the same, means to prevent material fed thereon from coming into contact with the arc ends of the electrodes and means to spread the arc over the hearth.

MINE REPORTS.

WAIHI GOLD MINING CO., LTD., NEW ZEALAND.

The Waihi Gold Mining Co., Ltd., reports for the year 1907, that there were treated in its reduction works 356,974 tons (of 2000 lb. dry weight) of ore, and that the gold and silver sold realized £878,485. This amount, together with £10,099 received as interest, makes the total gross revenue for the year £888,585. The expenditure in New Zealand and London, including development work at the mine, amounted to £357,674, leaving a gross profit of £530,910, as compared with £502,073 in 1906. This sum, added to the balance of £18,175 brought forward from the preceding year, gives a total of £549,086. Out of this the directors have provided £53,299 for sinking shafts, new plant, and machinery, as detailed in the balance sheet, as against £60,110 last year, and have written off 10% depreciation on plant and machinery, amounting to £35,012, as against £33,170 last year. The dividends paid, free of income tax, amounted to £322,339, being an excess of £24,795 over dividend distributed in 1906. The sum of £31,893 has been reserved for income tax in London and New Zealand for the year 1907. After these appropriations, the balance remaining to the credit of revenue account on December 31 was £106,541, which the directors recommend should be applied as follows:

To payment of a bonus of 3s. per share....£	74,386
To be carried to reserve (making a total reserve of £140,000)	10,000
To be carried forward	22,155
Total .....£	106,541

The bonus now recommended by the directors makes a total distribution of 16s. per share, or 80%, in respect of the year 1907. Since the date of the accounts to March 21, 86,306 tons (of 2000 lb.) of ore have been treated, yielding £200,951, and a dividend of 3s. 6d. per share was paid on March 2, absorbing £86,783. The directors propose to pay a similar dividend of 3s. 6d. per share on June 1, 1908, at the same time that the bonus of 3s. will be payable.

Further additions have been made to the ore-reserves, which on December 31 were estimated at 1,299,979 short tons, as compared with 1,029,658 short tons on December 31, 1906. The Royal lode was driven on for a distance of 769 ft. Of this distance, 406 ft. was driven east from the No. 5 shaft cross-cut, in ore varying in width from 1 to 25 ft., and in value from 11s. 9d. to £4 19s. per ton. West, 363 ft. was driven, in ore varying in width from 14 to 22 ft., and in value from 17s. 1d. to £2 8s. 11d. per ton. The total distance driven on the Royal lode at the eighth level to December 31, 1907, was 1425 ft. The Empire lode was driven on for a distance of 657 ft. to the west, making a total distance of 964 ft. from No. 4 shaft, northwest cross-cut. From a depth of 285 to 685 ft. the lode varied in width from 7 to 39 ft., and in value from 5s. 9d. to £2 8s. 10d. per ton. The Martha lode was cut at 584 ft. in the northwest cross-cut from the No. 4 shaft, and proved to be 110 ft. wide. The vein was driven on for a total distance on the south section of 1176 ft.—436 ft. east and 740 ft. west of the main cross-cut. On the north section the vein was driven on for the total distance of 952 ft.—616 ft. east and 336 ft. west of the main cross-cut. The total length of vein driven on the eighth level was 1356 ft. The values at the eighth level on the Martha lode show a falling off as compared with the level above, although the width has been fairly maintained. The Welcome lode was cut in the cross-cut from No. 2 shaft, and the south section met at 64 ft. from No. 2 shaft, proved to be 45 ft. wide, 25 ft. of which was worth £1 3s. 3d. per ton. The second portion of the vein met at 160 ft. from No. 2 shaft was 20 ft. wide, worth £2 5s. 2d. per ton. At 50 ft. west of the No. 2 shaft cross-cut the vein proved to be 120 ft. wide, worth £2 4s. 7d. per ton, and at 100 ft. west it was 100 ft. wide, worth £1 10s. 9d. per ton. The Edward lode was followed to the south for a distance of 200 ft., in ore of excellent quality. This vein opened up in a highly satisfactory manner, showing a large increase in widths and values compared with the level above. At 150 ft. south of the Welcome vein junction it was 48 ft. wide and worth £6 12s. 9d. per ton. It is proposed to increase the pumping capacity at the mine so as to have reserve pumping power for lower levels, and the sum of £10,000 has been appropriated toward doing this work. In comparing the year now under review with the previous year, it appears that there has been an increase of 28,108 tons in the amount of ore crushed. The assay value per ton was £2 14s. 11d., which is 2s. 9d. per ton less than last year. The actual yield per ton for 1907 is £2 9s. 2d., as against £2 10s. 11d. last year. The working expenses, which were reduced last year, show a still further reduction.

The tonnages crushed at the three mills, together with the totals crushed during 1906, were respectively as follows:

	1907.	1906.
Waihi mill (90 stamps) and 3 tube-mills, running full time—1 spare	117,409	111,056
Victoria mill (200 stamps) and 2 tube-mills all the year, 5 tube-mills during last two months...	211,062	189,261
Union mill (40 stamps)	28,503	28,549
	356,974	328,866

The increased tonnage during the year 1907 thus amounts to 28,108 tons. The total average number of stamps running during the year, exclusive of Sundays and the period at Christmas, during which the mills were stopped, was 316.488 out of 330 stamps. The total average duty per stamp per diem was 3.794 tons, representing an increase of 0.29 ton per stamp compared with the previous year.

The total extraction obtained during the year, according to assay, was 89.0% of the gold and 70.3% of the silver contents. This shows an improved extraction, as compared with 1906, of 0.5% of the gold and 4.2% of the silver. The estimated value of bullion scraps, zinc slime in precipitator boxes, and concentrate in treatment plant on hand shows an increase of £3385 17 shillings.

BOOKS RECEIVED.

'Lead and Zinc in the United States.' By Walter Renton Ingalls. Pp. 368. Ill. Index. Hill Publishing Co., New York. 1908. Price $4 net. For sale by the MINING AND SCIENTIFIC PRESS.

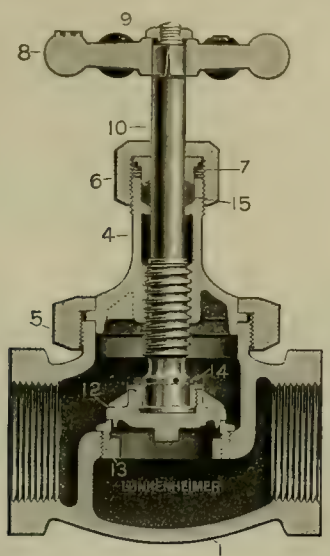
This work was prepared at the instance of the Carnegie Institution of Washington, to constitute a part of the economic history of the United States. It is accordingly distinctly a historical review, but being done by one of the leading technologists of America, it is replete with scientific fact and suggestion. The subject is systematically developed. The occurrence of the ores of lead and zinc is considered geologically and by States. In the discussion of metallurgical methods stress is properly laid upon the later improvements, such as lime or pot-roasting of lead ores, and the adaptation of magnetic concentration to zinc ores. Statistics of production, consumption, and price are given, and a most illuminating summary and discussion of the history of tariff legislation on lead since 1789, constitutes a most interesting chapter. The book is packed with information, and is eminently readable. It does not in any sense replace the treatises on zinc previously prepared by the same author, nor does it take the place of a guide to the metallurgy of lead. It is such a work as any well-informed progressive business man could read with profit and pleasure, and which any technical man connected with lead and zinc production cannot afford to neglect.

WILLIAM KENT has resigned from Syracuse University and will devote a year to the revision of his well known 'Mechanical Engineer's Pocket Book.'

THE ENGINEERS' CLUB, of Philadelphia, announces that its address is changed to 1317 Spruce St., Philadelphia, Pennsylvania.

RENEWABLE SEAT RE-GRINGING VALVES.

The Lunkenheimer Co., Cincinnati, Ohio, has designed the valve shown in sectional view herewith for the benefit of those preferring a renewable seat re-grinding valve. This valve differs from the Lunkenheimer regrinding valve only in the construction of the disc and seat. The disc, 12, is provided with a projecting ring, which enters the valve-seat ring, 13. Its principal function is the preservation of the seat, which is accomplished in a two-fold manner. First, as it enters the cylindrical part of the seat it deflects the current of steam from the seat-ring face, thus preventing the wire-drawing which would otherwise occur.

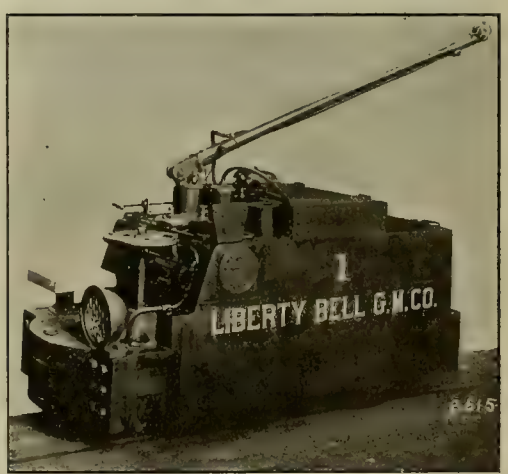


This feature is especially important should the valve be left partly open for any length of time. Secondly, the seating surface is kept free from scale and grit by the action of the thin current of steam discharged over it as the disc is brought home. Another function of this ring is the prevention of waterhammer which is caused by the sudden admission of steam, for it will readily be seen that no matter how quickly the hand wheel may be operated the flange will only permit the steam to enter gradually. The seat, 13, is renewable, and can be removed from the valve-body by using a flat bar to engage the lugs on the inside of the ring. The Lunkenheimer Co. calls particular attention to the fact that the seat may be re-ground a number of times before it is necessary to renew it. Not only is the seat renewable, but all of the other wearing parts, including the disc, can be renewed if necessary. The hub is securely held to the body by means of a union-ring, owing to which it is impossible for the hub and the body to become corroded together, as the thread which holds the union to the body is protected at all times from the action of the steam, the joint being made between the flange on the hub and the neck of the body. This connection also acts as a tie or binder in screwing over the body, and tends to strengthen the valve. The stuffing-box can be repacked under pressure when the valve is wide open, as a shoulder on the stem directly above the threads forms a seat beneath the stuffing box. All valves above the ½-in. size have a gland-follower in the stuffing-box. Lunkenheimer renewable seat-valves will stand 200 lb. working pressure, and are made in both screw and flange ends. Up to 1½ in. inclusive, valves are furnished with hexagon bonnet-rings; above 1½ in., round slotted rings are sent. Either style of ring can be had for any size of valve without extra charge. English instead of American standard pipe-threads and flanges are furnished when so ordered. The valves are also made with 'navy-standard' flanges, and brass hand-wheels. With the exception of the seat rings these valves are made entirely of the highest grade of bronze, according to the formula specified by the U. S. Navy. The seat-rings are made of hard, close-grained nickel, and will permit of re-grinding many times over. To re-grind, unscrew the union ring, 5, take the trimmings from the body, and place a little powdered sand or glass and soap or oil on the disc, inserting a wire or pin through the slot in the disc locknut and hole in the stem. Then replace the trimmings in the valve body and re-grind, leaving the ring unscrewed, so that the hub will rotate in the body and act as a guide for the stem while re-grinding. The Lunkenheimer Co. has issued an attractive booklet describing this new valve which will be sent on application.

RECENT ELECTRIC LOCOMOTIVES FOR MINE HAULAGE.

The extensive use of electricity as a motive power in mine haulage is proof that its employment has passed the experimental stage. The electric locomotive is compact and simple in construction, and does not impair the sanitary condition of the mine. The same source of power that drives the locomotive can also be used for operating fans, pumps, hoists, and other machinery. By combining the power-requirements in this way, the load fluctuations are reduced and the entire plant can be more economically operated. The accompanying illustration represents a locomotive for mine service recently built for the Liberty Bell Gold Mining Co., of Telluride, Colorado, by the Baldwin Locomotive Works, and equipped with electrical apparatus supplied by the Westinghouse Electric & Manufacturing Co. It is an exceedingly compact machine, having an approximate weight of 7000 lb., and designed for a track gauge of 2 ft. The width over all is 2 ft. 11 in., the height 3 ft. 7½ in., and the length 6 ft. 6 in. The frames, which are of cast-iron with bumpers of the same material, are placed inside the wheels. The wheel-base is 2 ft. 3 in., and the wheels are of chilled cast-iron 20 in. diam. The locomotive is of the single-end type, and the equipment includes brakes and sanding devices on all the wheels.

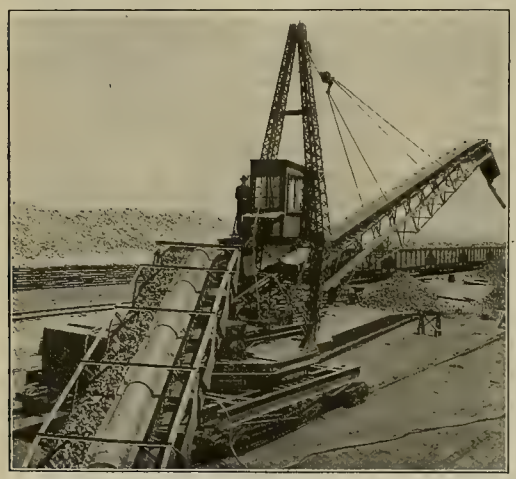
Both pairs of wheels are driven through one motor,



which is of the K-7 type, suitable for 220 volts pressure, and connected to the axles through double-reduction gearing. The motor is carried on a cast-steel cradle supported directly on the axles. It is placed above the wheels and midway between them, and is geared to a shaft placed immediately beneath it, which shaft is in turn geared to both axles. With this arrangement the gears are held in correct alignment while running over rough tracks, and there is an equal distribution of power between the two pairs of wheels. The motor is covered by a sheet-metal hood which may be opened on top, making the equipment readily accessible. The flexibility of an electric power system is one of its chief advantages, and in the case of the locomotive this is a feature of great importance, and these motors can be designed to fulfill practically any conditions existing in underground work.

STORAGE MACHINE.

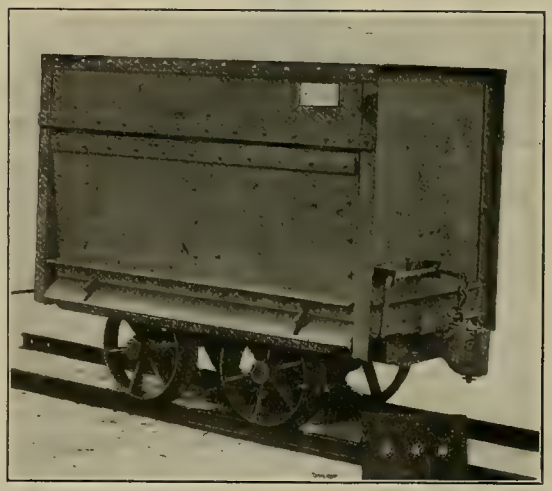
A beautiful, efficient, and remarkably flexible machine on the flight-conveyor principle for storing and handling ores, coal, and other products, has been developed by the Hamilton Manufacturing Co., of Columbus, Ohio. The accompanying illustration shows an exceedingly powerful machine in use at the storage yards of the Illinois Steel Co., at Stockton, Ind., handling coke. The coke pile is 35 ft. high. On the 100-ft. platform are stored some 100,000 tons of coke, which this machine is employed to load and unload. In one day's run, 4¾ hours' total time, the machine loaded 24 steel hopper bottom cars, containing in all 732 tons of coke. Three men are needed to operate the machine, the capacity of which is about 3000 tons of coal daily. The cost of loading is about 1c. per ton. Heretofore, in order to break the coke as little as possible, it has been loaded by hand at a labor cost of 19c. per ton. The machine, therefore, effects a net saving over the cost of hand loading of $100 per day. It is operated on its own track by its own power. The gathering conveyor is mounted to swing universally about the head shaft, its nose continually resting upon the platform, so that the scraper conveyor is able to pick up material from any part



of a platform 100 ft. wide. The material thus carried up is delivered to a second conveyor which swings about the head shaft on a turn table. It will deliver material into cars at either side of the platform, or, in fact, at any point that may be desired, within its radius. As the latter conveyor may be raised and lowered, it will stock material to a height of 35 ft. Material can be transferred both into and out of storage, at the rate of four to six tons of bituminous coal per minute, and as the speed of the gathering conveyor is very low, it accomplishes this without damaging the material. The Illinois Steel Co. credited the machine with a saving of 5% in the condition of the coke as delivered into the railway cars, thus amounting to a saving of 25c. per ton. On the basis of 100,000 tons per diem such an economy will save the cost of the machine in one year. Aside from the machine itself, the track on which it runs, and the trestle at the side of the yard from which the material is dropped to the platform, there is no investment in plant. When additional storage is called for, all that is required is to extend the track and trestle, for the machine moves as it builds or re-loads the pile all along the length of the platform. In other words it has the elasticity of a locomotive crane, and the capacity of a traveling bridge, without the limitations of either, while its first cost is stated to be 25% less than that of any other system having equal capacity. The Hamilton Co. builds different sizes between their pit-car loader, having a capacity of 30 to 40 cu. ft. per minute, and the large machine running as high as 300 cu. ft. per minute. The mine-car loader, built on the same principle, is adapted to tunnel work, as well as to other situations underground.

NOVEL SIDE-DUMP MINE CAR.

An order has been completed by the Arthur Koppel Co., of Koppel, Pa., for 200 mine cars for the Copper Queen Consolidated Co., Bisbee, Arizona. The cars were especially designed for that company, and had a capacity of 21 cu. ft., and a gauge of 20¼ in. The side door and end-plates are built of $^{3}/_{16}$-in. steel and the floor-sheets of ¼-in. steel. The dimensions are, length over all, 6 ft. 1 in.; width, 2 ft. 8 in.; and height, 3 ft. 10 in. The wheel-base is 21 in., which allows it to take curves of as small a radius as 15 ft. with ease. Spoke wheels of cast steel are used, these being equipped with Siamese roller bearings, which reduce the tractive-power and lubricating expenses materially. A unique feature of the car is the arrangement of the door-operating mechanism. This is worked by a 'trip' placed between the rails at any point on the line where it is desired to discharge the car. This mechanism is secured to the under frame instead of to the floor of the car. The principal advantage of this arrangement is that there are no rivet-heads or bolt-heads on the inside face of the floor-sheets to interfere with the discharge of the load. This was a requirement made by the Copper Queen Co. The doors are automatically re-locked when they fall into posi-



tion after the load has been discharged. The whole design is exceedingly simple, and conduces to durability and economy. All parts are riveted together, thus eliminating all troubles which might arise through the slipping of the nuts, screws, and so forth.

COMMERCIAL PARAGRAPHS.

S. F. Shaw has opened an office as mining engineer at 737 B St., San Bernardino, California.

Mark R. Lamb, Mexico, D. F., has recently closed a contract for a 150-ton Moore filter for a mining company in Pachuca.

Fairbanks, Morse & Co. announce that they have moved into their new general office building at Wabash Ave. and Eldredge Place, Chicago.

The Colorado Iron Works, Denver, announces that James P. Evans has been appointed to the superintendency, a position made vacant by the death of J. H. Morcom.

C. Kemble Baldwin has severed his connection with the Robins Conveying Belt Co., and is now chief engineer of the Robins New Conveyor Co., with offices in Chicago.

Arthur Koppel Co., San Francisco, have in the last few days shipped several miles of portable track consisting of 12-lb. rails. The order also included a number of cars and switch sets.

The C. W. Hunt Co., New York, has issued Pamphlet No. 081, illustrating and describing some of the labor-saving machinery manufactured by it, with special reference to coal handling and conveying.

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Editorial.

THE COPPER MARKET shows a healthier tone, electrolytic having advanced slowly from 12.50 cents on July 1 to 12.63 by the end of last week, at which point it has since remained. Curtailment of the Montana output in June owing to flood-damage would suffice to explain this condition, anticipated copper stocks being short about 13 million pounds.

A SPIRIT OF FRATERNITY among men could not well proceed from a better source than common love for the alma mater that prepared them to enter the battle of life equipped for successful effort. This spirit brought forth good fruit at the recent annual dinner of the alumni of the Royal School of Mines, resident in South Africa, through the appointment of a permanent committee to further the interests of those united by this bond of fellowship. A pleasant feature of the arrangement is the provision made to welcome new arrivals. Any alumnus proceeding to South Africa for the first time is requested to communicate with the secretary, Mr. C. Baring Harwood, at the Rand Club, Johannesburg.

CREOSOTED TIMBER is not used to any large extent as yet in mining operations. This seems to be due in part to lack of interest in or understanding of the benefits to be gained, and also from the desire of managers to keep down present costs, regardless of what the balance sheet five years later might reveal. Any mine which has expectations of surviving for a period longer than five years cannot afford to use untreated timber in shafts, gangways, and other openings intended to be kept open for traffic. The great majority of mines erect works before a justifiable development of ore has been made, and exist in a precarious condition, with ore-reserves inadequate to admit of the introduction of economies which could be practised were it possible to take a sufficiently long look ahead. But timber is not only increasing in cost; it is destined to become practically prohibitive for use in our prevailingly reckless and uneconomic manner.

Overthrowing Railroad Monopoly.

WE recently called attention to the striking fact that New England and the Pacific Coast resembled each other through an unfortunate likeness of exorbitant trust-made freight rates, under which each suffered repression of industrial growth. In New England the average freight rate per ton mile was 1.17 cent in 1907, while in the Pacific States it was 1.25 cent. Every other section of the United States enjoyed decidedly more favorable conditions. New England has been the home of staunch

patriots, and has been particularly distinguished for the display of that more restricted form of devotion to public welfare known as civism. The highest type of civism would, of course, result from the simple application of the golden rule. It is believed to be an excellent rule, though quite generally disregarded, and not sufficiently practiced to have yielded extensive data concerning its working effect. As a substitute therefor, we resort now and then in a spirit of reform to compulsory methods of making the other fellow do unto us as we ought to do unto him. In this brief argument we have gathered together the root, trunk, and branch, and a clear vision of the nourishing soil, of what we term paternalism. This does not mean always to pamper and coddle; in fact, since the wiping out of vast legalized monopolies in England, such spoiling of the Anglo-Saxon child has been done under the guise of tariffs and subsidies. But the truest paternalism is that which looks after all the children, and Massachusetts, having seen that individual civism could not protect the commonwealth from being strangled by a dominating railroad system, resorted to collective civism with such effect that a new era is actually dawning. Although a corporation is a legal person, it is not recognized in law as an entity with the privileges pertaining to individual liberty, which is particularly true of a public-service corporation. It is subject to higher restraints. The argument for such distinction need not concern us here. It is a fact, and the asserted right of corporations to freedom of action and secrecy of method, is being more extensively invaded year by year.

Massachusetts has been suffering an industrial depression for more than a decade that has been like the extension of paralysis through the community. Railroad rates have been simply intolerable and discriminations against New England ports in favor of New York have been more pronounced. The New York, New Haven & Hartford railroad gradually acquired ascendancy over all the great arteries of traffic. The people demanded reciprocity with Canada as a relief. Meanwhile the railroad monopoly was preparing to eat the apple of reciprocal trade, and it was doubtful whether there would have been any core left for the other boy. The acquisition of a control of the Boston & Maine with its ramifications into Canada placed the monopoly in a position to reap the chief benefits that might accrue from a reciprocity arrangement. The railroad finally received its rebuke. An act, known as the Cole bill, was passed by the Massachusetts legislature, under which the Attorney General may secure an order of court restraining a corporation from participating in the dividends upon stock held by it in another corporation. The remedy is simple and so effective that the New York, New Haven & Hartford Railroad Company is selling its holdings in the Boston & Maine, and in the electric trolley lines throughout the State. Competition will consequently be revived, and commerce, freed from burdensome restrictions, can move again, allowing the dormant activities of the people to re-awaken.

This little chapter in politico-economic history is instructive. It shows what can be done to give every citizen the even chance which is needed for healthy industrialism, if the people will rally to the primaries, and do their civic duty in overwhelming bossism so as to elect at least a working-majority of honest men to the Legislature. Industry is throttled in the West as it has been in New England; our mines have been robbed, and large numbers of properties that should have swelled the mineral output are lying idle, because of the crushing freight-tolls exacted by the transportation monopoly. New England is achieving emancipation which will doubtless extend to all phases of her commercial life, for the taste of freedom creates a larger appetite. Perhaps the spirit of independence in the West is not so far extinguished but that we may hope soon to see an emulation of the courage and practical wisdom of the awakening New Englander.

Professional Ethics Again.

THERE is encouragement to be drawn from the fact of a growing interest in the ethical problems involved in a proper discharge of duty by the mining engineer. The present is a peculiarly appropriate moment for penitential reflection, and this leads inevitably to ethical considerations. Many things have fallen out otherwise than the public hoped and anticipated; the mining world has passed through experiences chastening to its spirit, and not a few men are wondering how far depreciation of reputation has proceeded. Questions of abstract right accordingly assume special interest at such a time, both for the public and for the engineer. *The Financial News*, of London, has referred to recent expressions of opinion in these columns with that sort of criticism which proves that the question is not academic, but vital and pressing for solution. This appears further from the fact that our contemporary promptly separates the general principle involved from the specific case which we discussed. Of course that materially enlarges the field; it even expands it far beyond the limits examined by *The Financial News*. It is too large a subject, for that matter, to be expounded with any pretence at finality by an individual. It must be determined by the consensus of opinion of a representative body of those chiefly concerned, and we are pleased that the recently organized Mining and Metallurgical Society of America proposes to endeavor to formulate rules which will be conclusive, and which shall become recognized as the standard of professional custom to which all mining engineers must conform in order to remain in good standing. It is not an easy task, and we foresee friction enough to generate a high temperature. One difficulty is that some of the questions concerned in making any code of so-called professional ethics, are only distantly related to pure ethics. They represent matters of expediency and good form, but necessary as a means of protection to the public and to the engineers themselves. There is no moral wrong in an engineer holding an interest in a property which he has examined; there is not

even any moral obligation which could require an honest man to decline contingent fees, granting that he believed his judgment would not be warped by the self-interest at stake. It is most probable that he could not make such an examination without bias which might work injury to future investors. It this could be proved, then moral rectitude would preclude acceptance of an engagement on such a basis. It would certainly bias the minds of the vast majority of men to the point of incapacitating them for accurate examination, critical use of data, and sound justifiable conclusions. But a few men may be found who could face the utmost temptation of self-interest without change of heart-beat or deflection from the mathematical line of absolute integrity of thought and motive. Therefore it is not a case of pure ethics; but in deference to the prevailing Adamic weakness, and to the need of so protecting the investing public that the mining engineer may, in furtherance of his ultimate pecuniary advantage, win confidence and have his services regularly esteemed and well remunerated, the matter assumes importance as a necessary part of a code of professional ethics. An engineer should not work for contingent fees. We know that, because of the errors it continually leads to, and the unscrupulous class of promoter with whose operations the practice is perpetually associated. It is a custom that prevails in connection with those evils that walk in the darkness within the realm of mine-promotion.

Since our esteemed critic chooses to depart from the specific instance calling forth our remarks, which was the justifiableness of the engineer, who had reported on the Yukon Gold properties, in selling his stock when the price soared to a speculative height, we will follow his lead. He declares, "it is difficult to see why any honest mining engineer should be required to hold his shares until his own estimate of value is actually attained by the shares, while a vendor of port wine for 'laying down,' who says that the wine will, within a certain period, double its value, escapes reproach, even though he does not keep the wine himself, instead of selling its potential betterment to other people. The greatest error of the early political economists was to assume that in all commercial transactions the whole advantage remains with the seller, and the entire loss with the buyer. It is not so. Any commercial transaction, conducted on the ordinary lines of fair-play, candor, and honesty, advantages both parties. A mining engineer may quite honestly believe that certain shares are worth £5, and that they will ultimately reach that price; but he is not necessarily a rogue because he sells at £3, for all that." By no means; we quite agree. The first consideration, however, is whether the reporting engineer should have had shares to sell. Opinions differ, but we believe the final judgment will be that it is unprofessional. At present we are in a formative period; professional sentiment is growing, and the rule of propriety has not been rigidly drawn, largely for the reason that there has been no competent authority to draw it. Having the shares, he is entitled to sell to his advantage, retaining a perfectly clean conscience so long as he has not directly or indirectly manipulated or influenced the public to produce inflated prices. Our contention was that the price at which Yukon stock was selling was the result of misrepresentations, and was, to use the most charitable phrase, highly speculative. The public has its own logical habit of thought, which must be reckoned with whether philosophically defensible or not, and in this case it interpreted the sale of stock by the examining engineer as evidence that he also considered the prevailing market price unwarranted.

The wine was not ripening and gaining value. A company was in existence, costly to maintain, and the mines were producing nothing. Certainly the gold was not growing in the placers, but most assuredly large promoter's profits were accruing, leaving less to go round at the prospective banquet of the stockholders. Most decidedly the wine was not improving. Leaving this aside, the argument is faulty because a mine is essentially subject to decline. Discoveries from time to time may demonstrate larger returns than were anticipated when the company was organized. If the original capitalization were conservative, such adventitious circumstances will, of course, augment the market price of the stock. But the maturity of a mining share is marked by its amortization, which may involve resurrection of the capital, or burial in the tombs of financial disaster. It is not like the ripening wine, in whatever light it be viewed. So we come back to our original statement that "if mining companies encourage their engineers to buy stock, they are estopped from complaining against the selling of that same stock whenever the price becomes inflated."

The company should not encourage the engineer to become a stockholder unless it expects him to stake his whole future on the success of that enterprise. Then the reward must be adequate, and the engineer should definitely retire from general practice. We believe that in time laws will be enacted requiring endorsement by qualified engineers of mining stock offered for public subscription, and debarring from qualification any engineer holding present or prospective interest in the company issuing the stock. No standards of professional ethics have ever been established that have exercised any controlling or even important influence save through legal confirmation, and penal prescription. The status of the professions of the law, medicine, and architecture, reveal the force of this. Some professions do not seem to call for such restrictions, but the fact that both the mining engineers and the general public are keenly sensitive to the existence of conditions demanding a strict construction of the obligations of the profession, shows that it is not a trade, concerned only with skilful and conscientious performance of work, but that moral issues are involved in the functions of the mining engineer. These must be defined by those most competent to decide, and rules set forth. Then must follow the sanction and safeguards of law in order to render them of any effect as between practitioner and client and the public.

Personal.

W. S. Noyes is in Oroville.

H. F. Fulton is in Montana.

Frank H. Probert is at Globe, Arizona.

Samuel Newhouse, of Salt Lake, is in New York.

J. Parke Channing was in San Francisco this week.

T. A. Rickard will be in Fairbanks, Alaska, next week.

Albert Ladd Colby, of New York, is at present in London.

E. N. Atkins has been in Tuolumne county the past week.

C. W. Dodge, Jr., is now in charge of the Denver office of Spurr & Cox.

J. E. Spurr has been in Pima county, Arizona, in the interest of the Guggenheims.

Robert J. Coleman arrived in San Francisco from Denver, and has gone to Los Angeles.

Edmund Juessen, consulting engineer to the Mines Exploration Co., is in San Francisco.

Walter W. Wishon has gone to examine the Lake Shore gold mine, in Madison county, Montana.

John Power Hutchins is in British Columbia, near Revelstoke, examining a dredging property.

Gardiner F. Williams has gone to South Africa for a brief visit to Kimberley and Johannesburg.

Jos. B. Settle, formerly manager for the African Gold Dredging & Mining Concession, has returned to London.

W. Arthur Sloan has been appointed chief chemist at the smelter of the Shannon Copper Co., at Clifton, Arizona.

E. C. Holden has been appointed to the professorship of mining engineering at the University of Wisconsin, at Madison.

J. M. Callow is in Juneau and the Yukon territory on professional business, and will return to Salt Lake the first week in August.

T. R. Drummond, formerly manager for the Dominion Copper Co. in British Columbia, has been appointed manager of the Cactus mine, at Newhouse, Utah.

Robert H. Richards is making a professional tour in Arizona, Utah, Montana, Idaho, and Colorado, and will reach Boston by the middle or end of August.

J. F. M. Roberts has returned to Leon, California, from Grasselli, Indiana, where he was engaged in erecting the silver refinery at the works of the U. S. Metals Refining Company.

Wm. P. Miller, Jr., has resigned the managership of the Cia. Minera de San Andrés de la Sierra, Durango, Mexico, to operate the San José de los Llaintos mine at La Portilla, in the same State.

Fred Lyon, who was recently made assistant manager of the United States Smelting, Refining & Mining Co., has completed an inspection of the company's property in Utah and is now on a like mission in California.

L. Vogelstein & Co., New York, give the following figures of German consumption of foreign copper for the months January to May 1908:

	Tons.
Imports of copper	72,247
Exports of copper	3,354
Consumption of copper	68,893

The consumption during the same period in 1907 was 47,979 tons. Of the above quantity 67,155 tons were imported from the United States.

Engineering Societies.

The American Chemical Society will hold its general meeting of the summer of 1909 in San Francisco. The exact date will be decided by the president and secretary.

Latest Market Reports.

LOCAL METAL PRICES—July 16.

Antimony	12@16c	Quicksilver (flask)	$45@45.50
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.85@ 5.80c	Tin	31¾@33¼c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
July 10	12.63	4.43	4.45	53¼
" 11	12.63	4.43	4.45	53¼
" 12	Sunday.	No market.		
" 13	12.63	4.43	4.43	53⅜
" 14	12.63	4.43	4.43	53⅜
July 15	12.56	4.43	4.43	53⅜
" 16	12.56	4.43	4.43	53¼

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 9. £. s. d.	July 16. £. s. d.	
Camp Bird	0 13 0	0 13 0	
El Oro	1 6 3	1 3 9	ex div.
Esperanza	1 14 0	1 14 6	
Dolores	1 10 0	1 10 0	
Oroville Dredging	0 10 6	0 10 6	
Stratton's Independence	0 1 6	0 1 6	
Tomboy	1 7 6	1 2 6	ex div.

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. July 9.	July 16.
Amalgamated Copper	70⅛	69
American Smelting & Refining Co	84⅜	83¼
Boston Copper	12⅛	12⅜
Butte Coalition	24	25
Cumberland Ely	7¾	7⅞
Dolores	6¾	7⅛
El Rayo	1 15/16	2
Giroux	3¼	3⅜
Greene-Cananea	10⅞	10⅞
Indiana Sonora	4¾	4¾
La Rose	5¼	5⅜
Miami Copper	7	7
Nevada Consolidated	12⅝	12¼
Newhouse	5½	5½
Nipissing	7¼	7⅛
Ohio Copper	2¼	2⅜
Tennessee Copper	35¾	36
Utah Copper	34¼	34⅛
Yukon	3¾	3¾

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, July 16.

Atlanta	$ 19	Laguna	1.10
Belmont	90	Manhattan Con	9
Columbia Mtn	17	Midway	38
Combination Fraction	80	Montana Tonopah	1.35
Daisy	80	Nevada Hills	1.70
Fairview Eagle	40	Rawhide Queen	1.60
Florence	3.10	Sandstorm	28
Gold Bar (Bullfrog)	4	Silver Pick	17
Goldfield Con	5.82½	St. Ives	31
Gold Kewanas	35	Tonopah Extension	81
Great Bend	27	Tonopah of Nevada	7.90
Jim Butler	25	Tramp Con	18
Jumbo Extension	44	West End	72

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES — BOSTON.

	Closing prices. July 16.		Closing prices. July 16.
Adventure	4	Mass	6⅛
Ahmeek	70	Michigan	9½
Allouez	30	Mohawk	60½
Amalgamated	69	Nevada Con	12¼
Arcadian	3¼	North Butte	72¾
Atlantic	14¼	Old Dominion	36¼
Bingham Con	75	Osceola	101½
Boston Con	11⅞	Parrot	24½
Butte Coalition	25	Quincy	85
Calumet & Arizona	113	Rhode Island	3¼
Calumet & Hecla	660	Santa Fe	1¾
Centennial	25	Shannon	13¾
Con. Mercur	39	Superior & Pittsburg	—
Copper Range	73½	Tamarack	65
Daly-West	10⅝	Trinity	13⅜
Franklin	9⅝	Utah Copper	34
Granby	97	Victoria	5¼
Greene-Cananea, ctf	10¾	Winona	6⅛
Isle Royale	20½	Wolverine	132

General Mining News.

ARIZONA.

COCHISE COUNTY.

Martin Costello has foreclosed the first and second mortgages on the Copper Belle property, at Gleason. The amount involved is said to be in the neighborhood of $50,000. The sale of the property has been set for July 25.——The output of copper for the Warren district, during the month of June, was approximately 500,000 lb. more than that of the preceding month, due to the increase of operations at the Copper Queen smelter, at Douglas, and at the Calumet & Arizona smelter. The Copper Queen output was several thousand pounds in excess of the May production, and that of the C. & A. was 4,200,000 pounds.

GILA COUNTY.

The June production of Old Dominion was about 3,500,000 lb., approximately the same as that for May. Between 85 and 90% of this came from the company's own mines, and well over 90% of the entire smelter output came from the Globe district, the only foreign ores being about 100 tons per day of sulphide ore from California.

MARICOPA COUNTY.

James E. Cochran, of Bradford, Pa., has recently purchased the Buffalo mine in the Harshaw basin and will start extensive development. This mine, formerly known as the Jefferson, was worked by a Pittsburg company a number of years ago. There is a 90-ft. shaft.

PINAL COUNTY.

There is considerable activity in the Florence district, although most of it is only development work. The La Coronado property, which is being developed by Phoenix people with local capital is about 18 miles north of Florence. Men are now at work following the vein into the mountain.——At the Superior mine there are now 35 men at work, and arrangements have been made to increase this force as soon as there is room for more men. A large amount of ore has been blocked out and will be shipped before long.——The Queen mine, on Queen creek, 25 miles north of Florence, is being developed by Globe capitalists. Twenty men are at work, with the formation getting more favorable all the time.

SANTA CRUZ COUNTY.

Nogales held a drilling contest on July 4, the conditions and results of which are given herewith, obtained through the courtesy of Wallace, Glore & Summerhayes, mining engineers, of that city. The following rules governed the contest: "Contest to be double handed, each pair to drill for 15 minutes exactly, changing as often as they desire. All steel to be ⅞-in. diam., measured at a point 2 in. back from the cutting edge of the bit. No swedged steel to be used. No credit for lost holes through breaking steel or fitchered holes or other cause, except that if any pair drill through the rock they to be discounted 2 in. and allowed to start a fresh hole, full depth of which will be allowed. Staging to be set by each pair to suit themselves." The purse amounted to $350, plus entrance fees, but minus the actual expense of getting the rock. The net purse was $393. The amount of entrance fee was not stated. The rock used was an especially hard-grained granite, with scarcely no mica. The contest was won by Dunn & Daily, of Patagonia, who drilled 33⅛ in. and struck at the rate of 59.5 times per minute. Miller & Ryan struck at the rate of 87.5 times per minute, but drilled only 24¼ in., due to the fact that their steel was tempered too hard, and hence broke six times during the 15 minutes.

YAVAPAI COUNTY.

J. B. Tomlinson, controlling the Sterling properties, announces that it is his intention to move the present 20-stamp mill farther up the hill. A cyanide and slime plant suitable to the economic treatment of the ores, not only of his own, but other adjoining properties, is to be added. With the large tonnage now opened in the Sterling and other adjoining properties, which cannot now be shipped at a profit, but would be considered high grade under more favorable circumstances, the district will, with the new plant, soon rival other parts of Yavapai county in gold production. The Russell group of claims is particularly interested in this deal, as they and many others are tributary to the new mill.——Last month's output from the United Verde Copper Co. mines was slightly in excess of 3,000,000 lb. of copper. The United Verde is mining from both of its shafts, one of which is 1000 ft. deep and the other about 500 ft. A large part of the production is coming from the 5th, 6th, 7th, and 8th levels. For a while the United Verde was turning out its copper without the use of roasting ores, but these ores are now being utilized as formerly.

YUMA COUNTY.

(Special Correspondence).—A Los Angeles company, headed by George Mitchell, has purchased the Big Signal mine in the Wendendale district, and will, it is reported, erect a smelter at once. The property includes 100 claims and has extensive water rights.——Fifty men are at work at the Cunningham Pass property, in the same district. A new boarding and bunk-house is being erected and at its completion 20 additional men will be put at work. Teams are hauling ore to the railroad at Wendendale.

Parker, July 11.

CALIFORNIA.

CALAVERAS COUNTY.

The Mohawk mine, near Railroad Flat, has recently completed a test run of ore through its 9-stamp mill, and received returns of $26 per ton. The Mohawk shaft is a two-compartment incline 260 ft. deep.——The Blue Bell mine, on the south fork of the Mokelumne river, a mile and a half from Glencoe, has been bonded to the Golden Era Mining Co., of San Jose. A 40-stamp mill will be erected and active development undertaken.——The Matson custom mill on Cedar gulch is running a 40-ton mill test of the ore from the Occidental mine.

NEVADA COUNTY.

(Special Correspondence).—Considerable development work is going on at the Kenosha mine. The shaft is still going down with drifts showing excellent ore on the 200 and 300-ft. levels. A small force of men is employed.——At the Posey Canyon, driving is under way to develop the channel recently struck by the raise from the adit. It is reported that a small mill will shortly be erected. William Grant is superintendent.——The lower portion of the Central shaft is being cleaned up preparatory to the cutting of a station at the 5400-ft. level.——The working force at the Golden Gate mine has been reduced.——The work of re-opening the Grey Eagle mine is under way. The sinking of the shafts from the adit on the two vertical veins has been commenced. Fifteen men are employed.——Considerable activity is under way in the Washington district. The Yuba and Maybert are operating a large crew of men and pushing active work.——At the Red Ledge, where high-grade ore was recently found, development has exposed a promising lode of good milling quartz.——The Grass Valley and Nevada City districts are crowded with idle men. The present state of affairs is in marked contrast to a year ago, when it was difficult to secure enough men to keep the local mines running full-handed.

Grass Valley, July 13.

SAN BERNARDINO COUNTY.

It is claimed that vanadate of lead has been discovered on the North View claim, 7 miles south of Hart. The vein is 2½ ft. wide and also assays $93 per ton in gold.——The Hart Florence Mining Co. has started work on its Florence claim, and the Oro Belle Mines Co. will start some time during July.

SIERRA COUNTY.

The Megown mine, near Mountain House, has been leased to W. H. Blalock, of Reno, who is now working five men at the property. A 3-ft. vein gives assays of $9

per ton. A shaft will be sunk.——The Miners Home mine, at Howland Flat, which was closed all winter, is running again, having a crew of nine men.

SISKIYOU COUNTY.

J. M. Morrison has started the mill on his property, in Quartz valley, a mile below the Morrison-Carlock mine.——The Tennent mine, on Long gulch near Hawkinsville, has recently cut a blind vein, which is 30 in. wide and gives indications of being rich in gold.

TUOLUMNE COUNTY.

The Clio mine is being kept free from water and it is predicted that active operations will be resumed on this old and practically unworked property in the near future. ——The Kanaka will commence sinking as soon as preparations can be made. A new compressor and hoist have been ordered and will be installed at the Cassaretto shaft. ——Two men were instantly killed on the 1300-ft. level of the App mine, at Quartz, last week. Drilling in a missed hole was the cause of the explosion.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Shively adit, being driven to intersect the 500-ft. level of the shaft workings, reached the objective July 3, with the shooting of the last round of holes. This was a most important piece of mining engineering, and it means that one of the former heavy producers of the Georgetown district will be rejuvenated. During the early history of development, large bodies of low and medium grade ore were left in the workings, for the reason that material assaying less than $100 per ton could not be handled at a profit. However, under the prices now being paid for the basic metals, as well as the methods of treatment, the entire product will be available for extraction. Extensive development is planned in the exploitation of virgin territory. B. J. Martelon, of Silver Plume, is in charge of the proptrey.——Two shifts of miners are now employed at the Doric adit holdings. These mines recently passed over to a syndicate of Eastern men, headed by John Larsen, of Idaho Springs. It is reported that a new and modern compressor plant will be installed at an early date, as the equipment now in use is wholly inadequate. The adit, now in 3009 ft. is to be advanced for an indefinite distance. Stoping is under way upon the Cram vein cut 2400 ft. from the portal. A body of ore is being followed that is from 1 to 4 ft. wide, the last shipment bringing $170 per ton in gold, silver, copper, and lead. The property is situated in the heart of Georgetown, on Saxon Mtn.——The strike made in the heading of the Scepter adit two weeks ago, is coming up to expectations, the streak having widened from 8 to 12 in. As soon as the heading has been driven 38 ft. stoping is to be started. This property, including the Sunburst and Aston recently passed over to the Stewart-Astor Mining Co., the consideration being $150,000. A compressor plant is to be installed soon, at the Scepter workings. M. J. Riley is resident superintendent.——The Santiago, East Argentine, is sending out a heavier tonnage of ore than at any time during its history. On the 5th level, Nulph & Co. are carrying a stope on a streak of smelting ore that brings a settlement of $93 per ton in gold, silver, and copper, the last named metal running as high as 18%. Aliude & Co., who are at work on the level above, are stoping on a streak of mineral that is from 18 in. to 3 ft. wide, the first-class milling $45 per ton.——One of the most important mining deals which has been put through this season is that of the Waldorf Metals Co. for the purchase of the Huckleberry group of five claims, West Argentine, and a 10-year lease on the Independence, Wheeling, and part of the Commonwealth mines in East Argentine, all the property of the Waldorf Con. M. Co. The purchasing company will extend the Wilcox adit an extra 450 ft., or until the Wheeling-Independence vein is cut, and thoroughly developed the latter, as well as the Commonwealth, which has already been intercepted. A cross-cut is to be run from the base of the hill to intersect the Huckleberry vein. It will be necessary to drive only 200 ft. to reach the objective, and a depth of nearly 1000 ft. will be secured. Large capital from Kansas City, Mo., is back of the enterprise. D. F. Sprousse, of Georgetown, has been appointed manager.——Miller & Jacobs, leasing on the Tobin, have uncovered a 10-in. streak of polybasite, which gives assays varying from 350 to 400 oz. silver per ton. Stoping is under way and a carload is to be sent out within two weeks.——E. W. Shepard, leasing on the Wolverine, will start shipments in a few days. This lessee is stoping on a 5-in. streak of gray copper that shows assays running from 400 to 700 oz. silver.——H. J. Crist, leasing on the Choctaw, Saxon Mtn., is meeting with gratifying results, having shot into a 4-in. streak of $72 silver-lead ore. The discovery was made 18 ft. from surface. The mine was a former heavy producer.——A. J. Windnagel, owner of the Elsie group of four claims on Alpine Mtn., expects to start work in the course of a few days. The holdings are undeveloped, but the veins run parallel with the Sporting Times, which is producing high-grade gold-silver-lead ore.——The Terrible still continues to send out more ore than any mine surrounding Silver Plume. A series of lessees are at work on the 14th level and all are stoping on streaks of mineral that are from 8 to 20 in. wide. This is the deepest worked mine in Clear Creek county.——J. B. Warner, of Denver, has surrendered his lease upon the Stevens mine, West Argentine, as a deal is now pending for the transfer of the property. A heavy output has been made during the last three months.——Another strike is reported from the Colorado Central, Leavenworth Mtn. In extending the east drift a streak of ruby silver 16-in. wide has been uncovered that assays from 425 to 450 oz. silver. It is reported that F. A. Maxwell, the lessee, has secured control of the Husted mines which adjoin to the west.

Georgetown, July 14.

GILPIN COUNTY.

The Hampton Con. Mines Co. is preparing plans for the installation of electric equipment and air-drills on its Hampton group of claims, in Russel gulch, near Central City.——It is reported that the Black Hills & Denver Gold Mining Co. has adjusted its financial affairs so that operations can be resumed at their property in Boulder Park during the coming week. Eastern people are interested and it is expected that they will resume work in their shaft, afterward commencing work in the adit.—Denver people who are interested in the Smart property, at the head of Gamble gulch, near Central City, are figuring on resuming operations within a short time and will install a plant of machinery.

LAKE COUNTY.

The Ovens M. & L. Co., on Rock hill, in the Leadville district, has resumed operations. The property comprises 15 acres belonging to the Argus Mining Co., and has a 500-ft. shaft.——Ohio men, who last fall bought an interest in the Holy Cross property, are now installing a stamp-mill on that property.

OURAY COUNTY.

The first shipment of two cars of ore from the Lundberg lease, on the Yankee Girl, in Red Mountain, was made last week. Twenty-five carloads, valued at approximately $10,000, have been taken from the mine by these lessees since January.

SAN JUAN COUNTY.

The Black Wonder and the Sterling groups of claims, in Burrows Park, will be worked extensively this season. The Sterling is owned by F. J. Pienaars & Son, of New York, who have already started work. The Black Wonder has been purchased by English capitalists, who will make extensive improvements on the mill, including the installation of some new process for treating the ore.——The shipments of crude ore from Silverton, during June, exceed that of May by 20 carloads, while the shipments of concentrate show a decrease. The figures for June are 3100 tons of concentrate and 875 tons of crude ore.

SUMMIT COUNTY.

The new electric drills in the Arctic mine were started this week. The new mill at this mine will be ready for operation in the near future.——The Senator mill has been leased to D. B. Cox and J. E. Lawrence, of New York. The lease carries with it the right to use the Senator adit. The same men have also purchased the mining property belonging to Tobias Frieleweh, on North Star Mtn., and will drive a cross-cut from the Senator adit to strike the Frieleweh adit. A force of 25 men will be employed.

TELLER COUNTY.

According to report, the big Union mill of the U. S. R. & R. Co., at Florence, will be put in operation again as the result of the recent decision of the management of the Golden Cycle Co. in refusing to make any more contracts to treat custom ore. The U. S. R. & R. Co. is the only milling company of any consequence handling the output of the Cripple Creek district, with the exception of the Golden Cycle, and in view of the fact that the production of the camp is increasing it is very probable that it will be found necessary to re-open the Union plant.——Mullen & Co., leasing on the Rigi group, on Battle Mtn., have recently installed an electric hoist and new compressor. They expect to increase the shipment of ore to three cars per week.——The Isabella cyanide-mill has recently shipped a $12,000 gold brick, which is the clean-up from a 27-day run on the Isabella dumps. These dumps had been previously worked over twice by lessees and averaged only $3.50 per ton. The shipments of ore from the mine continue at the rate of about 45 cars per month, the ore assaying about two ounces per ton.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence.)—It has been announced that the Snowstorm Mining Co. will again join the list of dividend payers. The company has now paid off all the indebtedness, incurred during its period of idleness, but the management has considered it advisable to delay the disbursements of profits and to commence more substantial payments. It is generally believed that the dividends of the company will be the same as formerly, and at the rate of 3%.——Ore giving average assays of $85 per ton has been discovered in the New Chicago property, at Murray, and ten carloads have been taken out and are now ready for shipment as soon as the Idaho Northern railroad is completed.——The Mineral Farm property, near Mullan, will drive a 1200-ft. adit to reach its vein at a depth of about 550 ft. The portal of this adit will be less than half a mile from the Northern Pacific railroad and will run substantially parallel to the big tunnel of the Morning mine and at a distance therefrom of about 1000 ft. When ready for machine drills, electric power will be used and the transmission wires will be carried from the Morning mill, about half a mile distant from the portal. The vein on the property is over 100 ft. wide and shows a streak of five feet of heavily mineralized matter consisting of oxidized rock heavily impregnated with iron. ——Development operations on the Mastodon-Cœur d'Alene property, on Slate creek and near the line of the Chicago, Milwaukee & St. Paul railroad, will be resumed at once. The last development was through a 300-ft. cross-cut adit and the new work will be the running of a 900-ft. drift, which will give good depth on the vein. The property is a gold, silver, and lead producer. An 8-ft. drift was run for exploration purposes last year and opened up fair carbonate ore. The vein shows gold from the top and in the outcropping there is some silver ore. A large body of copper ore has been struck in the Copper Queen mine, by Sisson & O'Neil. The width of the vein has not yet been ascertained. The whole mountain shows copper stain and it is considered more than probable that a large deposit of ore exists. The mine is on the North Fork of the Cœur d'Alene river.——The annual meeting of the stockholders of the Alameda Mining & Milling Co. was held last week and 850,000 out of 1,325,000 shares of stock were voted. Officers were elected for the ensuing year. A statement was read at the meeting showing the condition of the affairs of the company. So far no pay-ore has been struck but the men at present are driving on streaks and good indications are in sight.——The Stanley mine, at Burke, has been closed for several days and from present plans it may remain closed for some time. The reason for shutting down is said to be the fact that the lease on the mill of the New Jersey Co. has expired and has not been renewed. The Stanley is owned principally by Spokane capitalists, and produces gold and antimony.——The drift being run on the property of the Rainbow Mining & Milling Co. has opened up a streak of ore giving a good content of gray copper. From 1 to 2½ ft. of ore has been exposed and assays of this give returns of 46 oz. silver, and 15% copper.——A fan is being installed at the property of the Black Traveller Copper Co.'s mine, near Saltese, and as soon as this has been completed the force of men at the property will be increased. A long adit is being driven to tap both leads at depth. The adit has been driven more than 560 ft. since work was started last October. It is estimated that 400 ft. more of driving will reach the first lead, while the second is about 650 ft. farther on.

Wallace, July 14.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—One of the most important movements in several months in the district is the reopening of the old Hartley land, at Cave Springs, by McCullagh & Murdock. The land is being drained by the installation of a pumping plant, which will be equipped to handle the great volume of water which has accumulated for several years. This land was once one of the leading centres of the district and 30 or 40 active mines were located here. All were abandoned with the exception of the Herald, which has been steadily producing the past year. The ground was worked to the 110-ft. level and many of the mines caved, allowing surface water to enter. The entire tract was full of water to within a few feet of the surface and the unwatering of the camp has thus become a very serious proposition. However, the new company has taken up the problem and already has drained the ground to the 80-ft. level. Work will be continued till the ground is workable to the 105-ft. level, when most of the old mines can resume operation. A new strike of importance was made upon the Bunco tract of this ground last week by Butler & Burress, of Galena. A good body of zinc-blende was struck at 74 ft. running from 12 to 15%. Four new shafts are going down in the vicinity, and many applications have been made for sub-leases.——The Herald Mining Co. has closed down for a period of 60 days to enable them to do some repair and development work. It is the plan of the company to sink the present incline shaft 75 ft. deeper, or until it penetrates the bottom of the ore deposit. The incline shaft will then be connected by drifts to the vertical shaft and ore hoisted from each. The Hartford Mining Co., operating south of Galena, has installed new machinery to facilitate the development of the ground. A new mill has recently been completed and will soon be ready to operate. The ground is not yet fully developed, but will be during the next few weeks.——An exceedingly rich strike was made north of Galena, on a lease adjoining the old Helen Hunt tract. The drill entered ore at 227 ft. after passing through limestone for some distance and at 299 ft. rich ore cuttings were still taken out. On the adjoining lease ore was entered at 225 ft. and continued to 274 ft. The dirt assays very high and the cuttings are said to be among the richest ever found in the Galena camp. Both tracts will be drilled and fully developed.——Boughton Bros., operating a 40-acre lease near Galena, have installed a new pumping plant and will have the ground drained this week. A number of prospects are ready for development on this tract and a concentrating plant has been erected by the original lessees.——Shellach & McKinney, after a long shut-down, have re-opened their property and started the mill. During the shut-down a large amount of development work was

accomplished.——The Old Abe and Myrtle mines, which were closed down some time on account of the scarcity of coal and low ore price, have again resumed operation. ——The Omaha plant is milling the ore from the Hobo mine, which, with the ore from the south shaft of the Omaha, keeps the mill running to full capacity. The Omaha has started the sinking of a third shaft on its lease.

Galena, July 13.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—Although the past few weeks has noted the closing down of a number of important properties because of the low price of zinc ore, still there have been a considerable number overhauled and put in operation. The Old Conqueror mine, in the Chitwood camp, has erected a new tailing elevator and after making other needed repairs on the plant, resumed operation. The ore is now taken from the southeast shaft near the Jack Rose line, where the dirt is exceedingly rich. McNeal and associates on the Jack Rose ground are developing the same run of ore and have cut an air-drift up into the Old Conqueror's drifts, thus furnishing ventilation to both mines.——The old Tussing, a former Bellville producer, re-enters the producing list after a long shut-down. The ground was drained a few weeks ago by a small pump. A 150-ton mill, on the property, is sufficient to handle the dirt. The ore is high grade, running from 4 to 5% zinc concentrate.——The Garnet mill, south of Carterville, is to be overhauled and put in operation as soon as possible. This property was closed down last year on account of a disastrous cave-in, but work was started on the ground this year. The ore was treated at the Fullerton mill, until that plant burned a few weeks ago. The mill upon the Garnet ground will now be repaired and made ready for the treatment of the ore.——A rich strike was made upon the Roach ground, west of Joplin, recently purchased by Roach, Radley & Glover. The deposit was opened at 100 ft. and consists of a 25-ft. face of ore running from 10 to 15% zinc-blende. The ore occurs in spar ground and the dirt hoisted is full of calcite crystals. The underground development will be hastened and the ore will for the present be cleaned upon hand-jigs.——In the Duenweg camp the Wolfsheart Mining Co., of Chicago, has opened up a rich deposit in the shaft at 232 to 241 ft. The ore is largely zinc-blende, though a small percentage of galena occurs. This mine adjoins the Lincoln and American Beauty No. 2. The company plans to erect a mill as soon as underground development is well under way.——A rich strike of zinc-blende was made upon the Reliance tract, south of Webb City, upon what was formerly called the Baker tract. One corner of the lease was very productive in the early days, but the remainder of the land was of doubtful value until the recent strike made in five drill holes. A shaft has been sunk which fully verifies the drill record.——A new deposit of galena and zinc-blende was opened this week, in Elm Hollow, by William Pierce and associates. An old lease was taken over and drilling begun which resulted in the discovery of a rich ore deposit at 112 ft. The shaft proved the ore to be richer than the drill showed. Driving has been done and a fine lot of ore hoisted which will for the present be cleaned upon hand-jigs.——The Porter tract, in the western part of Carthage, upon which several rich deposits were found, is now being developed. The pumps have been installed, a derrick built, and the shaft is being cribbed. This tract was one of the richest in the entire district some 20 years ago and is full of old shafts and drifts, which are being re-opened. One company while drilling last winter entered ore at 35 ft. and the drill remained in ore to 198 ft. The drill cuttings were among the richest ever taken from a mine in this district.——A deal was recently closed whereby Tobias & Eastwood, of Carthage, purchased a half interest in a lease of 10 acres of mining ground, north of Knight's station. The land is well developed mineral land upon which are three shafts in rich ore, and the whole tract is well proven by the drill records.——The Quick Seven Mining Co., of Alba, holding first lease on an 80-acre tract, subleased all but 12 acres of the tract for mining purposes. Mining men from all over the district were present and the leases were quickly disposed of. This tract was recently drilled and very rich ore found nearer the surface than had hitherto been found in the Alba camp. Shafts are now being sunk and development hastened preparatory to the erection of a mill. Eight or more drills are on the ground and prospecting work progresses steadily.——Several new mills are being completed or in course of erection which will soon be in the list of operators. The Brazos mill, north of Webb City, has been completed some little time, but owing to the necessary delays was started only a few days ago. The plant is of 300 tons capacity and will operate upon ore from the 170-ft. level—the common depth of the sheet ore in this part of the field. The ore is high-grade and will mill over 4%. The ground is not yet fully developed, but two shafts are into the ore-body.——The Endeavor Mining Co. has secured a lease upon the old Prudential tract, at Prosperity. The mill was burned some months ago, and a mill of 250 tons capacity is now being erected by the new company. The property adjoins the Get There lease, which was noted for its richness. The ground is well developed. One shaft is down 215 ft. and a second one is being sunk near the mill. Ore is being taken from both shafts.

Joplin, July 13.

NEVADA.

ELKO COUNTY.

The new mill of the Gold Crown Mining Co., at Gold Circle, will be in operation in about 60 days. It will be run by water-power generated from the Midas water works. It will be situated at the foot of East street.——A recent strike on the Golden Chariot property has created considerable excitement and mine lessees have started work. It is claimed that an 8-ft. vein will assay $250.——Considerable excitement is prevalent at Cobre, the junction of the Nevada Northern and the Southern Pacific, owing to the discovery of high-grade silver and copper ore about 12 miles east of there, in the Loray mining district. A vein 10 ft. wide, carrying 17% copper and 300 oz. silver, was uncovered a week ago by Kellough & Lang on the Lillian group, at a depth of 25 feet.

ESMERALDA COUNTY.

A strike of $3400 ore is reported at the Miss Jessie claim on the Laguna ground. The shaft will be sunk an additional 100 ft. and a cross-cut run toward the vein.——Work is to start at once on the Gold Button, in the eastern part of the Goldfield district. It is the property of Chas. F. Potter, and over $10,000 has already been spent in development.——An extension to August 1, 1909, has been granted the Liverpool Goldfield Co. by the Goldfield Consolidated Mines Co. The leasehold is on block No. 2 of the Golconda claim. At present the shaft is 400 ft. deep and is being sent down as rapidly as possible. No lateral work has been done and none will be attempted until pay-ore is struck.——A station is being cut for the second level in the Gotwaldt Combination M. & L. Co.'s shaft. The sill level is 305 ft. from the surface. A cross-cut will be run to the eastern edge of the block and the shaft will be sent to 500 ft. as rapidly as men and money can do the work. Meanwhile cross-cutting is in progress on the 255-ft. level, which is in solid quartz. The lease has been extended by the Goldfield Con. Mines Co. to September 1, 1909.——The Goldfield Con. Mines Co. has given R. W. Norrington an 18-months' lease on the south 400 ft. of the Grizzly Bear claim. Work has been started and an electric hoist installed. The operations are financed by the newly organized Consolidated Jumbo Mining & Leasing Co., which has $50,000 cash in its treasury.——The mines of Goldfield produced during the week ending July 10, a total of 2162 tons, the estimated value of which is $163,700. During the same period the Tonopah mines produced 4775 tons of an estimated value of $119,375.

EUREKA COUNTY.

The Cortez mine, at Cortez, 35 miles south of Beowawe, has been recently acquired by the Cortez Metal Recovery Co., of which A. W. Geiger and Eugene Hewlett are the moving spirits. The new company is now erecting a 100-ton cyanide plant to treat the old tailing from the hypo-lixivation plant, and will also open up and operate the old mine. A shipment of silver precipitate, cleaned up from the old mill, was recently made which netted $6000. Apparently the old camp of Cortez is on the eve of a season of renewed activity, and other well-known mines may be worked again.

HUMBOLDT COUNTY.

The Reagan-Hayes lease made a shipment of 30 tons of ore last week, from its holding on the Mazuma Hills ground at Seven Troughs. It is claimed that 60 sacks of the shipment will mill as high as $2500 per ton.——The hoist of the Prior-Chadbourne lease, the control of which was recently bought by Minneapolis capitalists, arrived on the ground yesterday and will be immediately installed. This lease adjoins the Reagan-Hayes lease on the north and contains the same vein system.——The first shipment from the Wihuja lease, at Seven Troughs, went out last week. Several sacks of picture rock were sent by automobile to Lovelock to be converted into bullion. It is safe to say the ore is worth $30 per pound and will net the company between $10,000 and $15,000. Some of the most beautiful specimens ever taken from this camp accompanied this shipment.——The Salt Lake Development Co., composed of a number of Salt Lake mining men, owning and operating the Santa Reta group at Farrel, in the north end of the Seven Troughs district, has taken up its option on the Yellow Metal claim, adjoining the Santa Reta. An excellent strike has lately been made on this claim and the company will now thoroughly develop it.

The Kindergarten Mining Co. has holdings that cover the series of parallel veins on the principal zone, but on the south side of the Seven Troughs canyon. Two veins have been opened by adit levels, from which winzes have been sunk on the ore. A new working shaft has been started higher up on the side-hill, where a gasoline hoist will be installed. The Kindergarten 10-stamp mill is being operated on ore from one of the veins referred to. The ore previously shipped ran $400 per ton, and the mill is running on ore that carries $120 per ton. The low-grade ore runs as low as $10 per ton, and this is to be mixed with the higher grade for treatment. L. A. Friedman is president of the company and C. H. Ellithorpe is manager.

The group of the Seven Troughs Mining Co. is 3000 ft. south of the Kindergarten, on the same belt. Friedman and Ellithorpe are also in control of this property. A vertical shaft has been sunk over 500 ft. and the purpose is to continue sinking to 1000 ft. The vein here has a width of 3 to 15 ft. and it has yielded some of the highest-grade ore in the district.

The Seven Troughs Signal Peak Mining Co. has a property lying between the Kindergarten and the Fairview. It is owned by the Salt Lake people, and is in charge of Frank McIntire. They have 870 ft. of tunnel-work, and a 65-ft. shaft. It is said that 145 ft. of this work is in ore that runs $55 per ton.

LANDER COUNTY.

The Austin-Manhattan Con. Mining Co. will soon begin operations upon an extensive scale at Austin. This company recently acquired 87 patented claims which included nearly all the old-time producers of the district. The enterprise is backed by a strong Eastern syndicate.

LINCOLN COUNTY.

The grading for the new smelter, at Nelson in Eldorado canyon, is completed and the work on the buildings is being rushed. The plant will have a capacity of 50 tons and is the first gas smelter to be erected in Nevada. The equipment includes two 50-hp. and one 10-hp. gas engines, three compressors, one 50-ton Loder furnace, gas generators, high-pressure pumps, and minor accessories. The plant will treat ores of the Searchlight-Santa Barbara Co., and will also accept custom work.——The Red Cliff property, comprising nine claims, and lying a short distance northeast of Searchlight, has been sold to E. L. Pollock and others, of Chicago.——The first car of ore, 662 sacks, from the lessees of the Double Standard, at Crescent, was hauled to the railroad and shipped from Nipton to Utah smelters last week. It represented the combined output of the Red Star Mines Co., Davis & Russell, and Tursick & Jones for June.——The new power-plant at the Day mine, at Jack Rabbit, is nearly completed, and will be in operation within a week.

NYE COUNTY.

The MacNamara mine is keeping up its heavy shipments of ore, three cars of over 50 tons each having been sent to the Belmont mill at Millers this week. This ore is of very good milling grade, averaging from $45 to $50 per ton.——The Madigan lease at Round Mtn. has been acquired by the Solid Gold M. & L. Co., of which C. E. Johnson is general manager. A Merrill mill has arrived and will be installed at once.——The Round Mountain Antelope Leasing Co. has recently uncovered two feet of rich ore which was found at a depth of 50 ft. Arrangements have been made to treat the Antelope ores in the new Daisy mill when it is completed.

WASHOE COUNTY.

It is announced that the new Selby mill, at Jumbo, will be completed and in operation by August 1. The timber has all been framed and the concrete foundations are now being put in. The ore from the Bargo will be the first to be run through the mill.——The shaft on the Syene, at Jumbo, has been cleaned out to a depth of 90 ft. and sinking has been resumed. The management expects to sink to a depth of 150 feet.

CANADA.

BRITISH COLUMBIA.

The ore shipments from the Granby mines for the month of June were 85,257 tons. The shipments for the first six months of 1908 total 379,574 tons, as compared with 278,893 tons during the same months last year—an increase of 100,000 tons.——A number of improvements to its local mines are now being planned by the Dominion Copper Co., among which will be an aerial tram line from the Idaho to the Stemwinder. Heretofore the ore has been shipped from the Idaho over the Great Northern railway to near Denoro, where it was transferred to the C. P. R. for shipment to the company's smelter at Boundary Falls. By shipping direct by way of the C. P. R. a saving of 15 cents per ton can be effected.——The Evening Star, at Rossland, has uncovered a new 4-ft. vein that assays about $38 per ton in gold.——The Bullion mine, at Olalla, resumed operations last week after a shut-down of two years.——What is thought to be the most valuable carload of ore yet sent from the south belt at Rossland, has been shipped by E. Welde & Son from the Mayflower mine. It is galena ore and is said to be worth $1300. The ore was carefully sacked so as to bring it up to as high a grade as possible.——A fire last Friday, at Grand Forks, destroyed one-half the business district, entailing a property loss of $250,000 and the killing of one man.——The Hewitt Mining Co. has been organized and certificate of incorporation granted. The head office of the concern will be situated in Wilmington, Delaware, and the local office at Nelson. The company will operate the Hewitt and other properties near Silverton.

MEXICO.

The Sta. Sofia mine, Sta. Catarina, Oax., will erect a 20-stamp mill.——The Huasteca Petroleum Co. has been given a concession to export oil and gas in the northern part of Veracruz. Harold Walker is the representative of the company which undertakes to expend $500,000 in exploration, pipe lines, and the like.——Plans are made for a 20-stamp mill and cyanide plant for El Favor mine, Hostotipaquillo, Jal. W. R. Ramsdell, Guadalajara, is the vice-president of the company and in charge of the negotiations for the new plant.

Special Correspondence.

LONDON.

Tywarnhaile Copper Mine.—Boscaswell Flotation.—Mond Nickel Co. —Brimsdown Lead Co.—Snowshoe Gold & Copper Mines, Ltd.

In your issue of May 30, I gave some information about the closing down of the Tywarnhaile copper mine in Cornwall. I have since been informed that one of my statements was incorrect, namely, that the suspension of operations was advised by Mr. W. Fischer Wilkinson. The fact is that I drew an incorrect conclusion from the information in my possession. It is true that Mr. Wilkinson several times examined the property on behalf of the Consolidated Gold Fields of South Africa, which Company had supplied the working capital, and it is true that the Consolidated Gold Fields decided to stop work. But I was wrong in drawing the conclusion that Mr. Wilkinson advised the Company to take this step. Personally, I owe Mr. Wilkinson an apology for placing a wrong construction on the information he had given me. To properly explain the circumstances I ought to mention that the mine was re-opened by the firm of Bainbridge, Seymour & Co., at the time when the original Elmore oil concentration-process was invented, and the chief shareholders in the Company formed were Mr. Emerson Bainbridge, Professor Cox, Mr. R. A. Varden, and Mr. Stanley Elmore. When it was found that considerable money was required to unwater the mine and properly open it up, the firm approached Mr. Wilkinson, who formerly was professionally connected with them, and who was at the time in the service of the Consolidated Gold Fields. In this way the Gold Fields became interested in the Tywarnhaile Co. and put up what was supposed to be the necessary additional capital. As regards the real reason why the mine was closed down, I can only give the official explanation that the Gold Fields considered that the funds in hand were not sufficient and that they did not see their way at that time to provide any more. This is what Pooh-Bah would call a "bald and unconvincing narrative," but under the circumstances we will let it go at that.

While writing of Cornish matters, I should like to mention that the flotation of the Boscaswell mines referred to by me last week has proved a failure. A certain amount of money was subscribed, but in the opinion of Mr. A. K. Barnett, of Penzance, and Mr. J. H. Collins, two of the directors, the amount was not sufficient for the purpose. So it has been necessary to return the subscriptions. It is a great pity, and I am sorry for Mr. Steuart, who must have dropped something like £10,000 in this abortive promotion.

A few weeks ago in writing of the firm of Brunner, Mond & Co., the chemical manufacturers of Northwich, Cheshire, I mentioned that some of the processes of a more speculative nature taken up by the firm were placed under separate organizations and operated independently. I instanced the Mond Nickel Co., and the Brimsdown Lead Co. The yearly reports of these two companies have now made their appearance so it is opportune to give some information about them. The Mond Nickel Co. has had a remarkably successful career during the last three or four years, and its prosperity is still advancing rapidly. The Company was originally formed in 1900, after Dr. Mond had experimentally conducted his new process for something like eight years, during which its commercial adaptability hung in the balance. At first the Company suffered reverses owing to the danger to life and health from the carbon monoxide and other fumes given off, but when once these troubles were overcome, the success of the Company was assured. As is well known, the Company produces a copper-nickel matte at its mines in the Sudbury district, Ontario; afterward refining the matte at Clydach near Swansea. The capital is £600,000 divided into £250,000 of 7% cumulative preference shares, £300,000 of ordinary shares, and £50,000 of deferred shares. After 7% has been paid each year on the ordinary shares, the remaining profit is equally divided between the ordinary and the deferred shares. The ordinary shares received their first distribution in 1905 when 6% was paid. In succeeding years this rate has risen to 10 and then to 15%. The deferred shares have received dividends of 18, 33, and 45% during the last three years. The demand for the Company's products, metallic nickel and copper sulphate, continues to increase, and the mine at Garson about 30 miles distant from the Victoria mines in Ontario, has had to be opened up and equipped. In order to provide more power, a plant for the generation of electric current is being erected on the Vermilion river, and it is expected that the Victoria mine and the smelter will be fully equipped with electric power by the end of the present year. In order to provide the necessary capital, and also to extinguish the loan-account created in the early days while the fumes-difficulty suspended the operations of the plant, the directors are intending to issue £250,000 new preference shares, for which a ready market can be obtained.

The other subsidary of Brunner, Mond & Co., the Brimsdown Lead Co., has been uniformly unfortunate and at the present time it looks as if the works would have to be closed. The operations consist in the application of the Bischof process for making white lead. It is one of the rapid methods of corroding lead by acetic acid, and its chief point of advantage lies in the fact that it produces initially a uniform oxide instead of a mixture of different oxides. I do not think that any advantage is claimed for the white lead produced except that the process occupies so much less time than the old Dutch method, and consequently has less metal locked up. On the other hand the process is of such a nature that the plant must work continually, and at full capacity. Consequently in dull times, metal gets locked up in unsold stock. I believe that the real cause of the failure of the process is the indifference on the part of the users of white lead. The qualities of certain old established brands are known so exactly by decorators and painters that unless a considerable advantage is offered in the way of reduction in price there is not sufficient inducement to try a new make. It is possible, that, if the white lead had been introduced as the Brunner-Mond instead of the Brimsdown brand, buyers might have come forward more readily. To be directly connected by name with a firm known for the quality of its chemicals is a large part of the battle. But I may be wrong in making this reflection, and there may have been good reasons why the greater name should not have been adopted. It is noteworthy, too, that there is not a Brunner or a Mond on the Board of Directors, though there are plenty of them to go round. The Brimsdown Co., though economizing in every way possible, continues to incur losses every year, and unless some heroic policy can be discovered, the end will have to come before long.

The Snowshoe Gold & Copper Mines, Ltd., owning the mines of that name in Boundary district, British Columbia, reports that it made a profit on operations during the financial year ending September 30 last, and that the debit balance is accordingly reduced. At the present time the mines are not being worked, owing to the low price of copper. Your readers will probably be familiar with the history of this Company, and will remember its flotation in 1901 by Mr. A. J. Macmillan. Though the ore deposits are extensive the contents are low, and the Company never paid a dividend. More recently the mine has been leased to the Consolidated Mining & Smelting Co., of Canada, and worked whenever the labor supply, price of coke, and selling price of copper, have been favorable. During the year ended September 30 last, the mine was worked by the lessees for about two-thirds of the time, the period of idleness being the winter of 1906-7, when the strike, the scarcity of coke, and imperfect transport facilities, suspended operations generally throughout the southern part of British Columbia. Altogether 92,017 dry tons of 2000 lb. were shipped by the lessees during the period under review, containing approximately 1.2 dwt. gold, 0.3 oz. sil-

ver, and 1.3% copper. The royalty on this ore, received by the Company, was £11,049, equal to 2s. 5d. per ton. Shortly after the end of the period the mine had to close down owing to the low price of copper. There are still very large reserves of ore in the mine, and when the right time arrives, work will be once more started. The profit won during the year has made it possible to reduce the debit balance from £39,309 to £32,212. The Snowshoe Co. is the offspring of the British Columbia (Rossland & Slocan) Syndicate, Mr. Macmillan's parent company. Mr. Macmillan is not now a director of either of these companies, having concentrated his attention on the Le Roi mine. The Syndicate is still the largest shareholder in the Snowshoe Co., and in addition it owns a number of other properties and options in British Columbia. One of the most interesting of these is an option on the Velvet-Portland property, from which considerable shipments of high-grade ore have been made in the past. Arrangements are now being made to resume, and we should hear of the commencement of operations before long.

JOHANNESBURG, TRANSVAAL.

Output for May.—Idle Mines Preparing to Resume.—Moddersfontein Shares.—Competition Between Kimberley and Premier Diamond Mines.—Randfontein Mines.— New Mills.

The returns for May show that this was a most satisfactory month for the mining industry. The total output for the Transvaal was declared to be 581,992 oz., valued at £2,472,143. An encouraging feature of the month's operation was the increased profits earned by the mines. The strenuous efforts being made by the mines to get the very best results are being reflected in the profits made by the mines. The Rand's contribution to the May output was 558,243 oz., valued at £2,371,265, while the outside districts produced 23,749 oz., valued at £100,878. During May there were 8920 stamps at work in the Transvaal, of which 8475 were crushing on the Rand. The largest producer for May was the Simmer & Jack mine, whose large battery of 320 stamps and four tube-mills produced 26,551 oz. fine gold. Second on the list was the Robinson mine, with 26,190 oz. fine gold. Third was the Robinson Deep with an output of 20,646 oz. There were fifteen companies that produced during May 12,500 oz. and over.

During May there has been quite a stir among the idle mines of the Rand, and there is strong talk of a number of them starting up very soon. The Bantjes mine, which has been idle since 1897, will no doubt become a producer in another year. The Aurora West mine is making preparations to begin crushing operations once more. Then, too, that huge deep-level proposition, the Simmer Deep, will start crushing for the first time by the end of the year. Taken altogether, the industrial development for the month of May is one of solid advance.

The fine showing being made by the mines of the Rand is attracting the attention of investors in Europe, and the share-market has been quite animated during the past few weeks. There is a distinct improvement among them all, and one or two of the leading shares have advanced very rapidly. Take Modderfontein, for instance; only a few months ago the shares of this mine stood at £4 15s. each, while today they are readily bought at £8 8s. There is every reason for the advance, for the mine has made great progress recently, and is now looked upon as one of the great gold mines of the world. Its future seems assured, and as there is a huge claim area, its life will be a long one.

The returning prosperity among the gold mines does not seem to affect the diamond mines, which are in a bad way. Things about the mines at Kimberley seem very depressed, after the lively days of the past. How this crisis in the diamond market will end, it is hard to say. While the severe financial depression all over the world has much to do with the trouble, it seems that the principal difficulty is the war between the Kimberley mines and the Premier (Transvaal) Diamond mine. If the market is swamped with diamonds, these jewels will be looked upon as marbles by fashionable people, and will not be much more valuable. If there is one business in the world that justifies the strictest monopoly, it is the diamond business. Cecil Rhodes saw this point very clearly years ago, but unfortunately South Africa has no such man now to direct her.

Of course mining people on the Rand are thankful for the better feeling existing here, but some of the more thoughtful are asking whether the improvement is permanent, or only a spurt in the market. The labor difficulty causes most apprehension for the future. It is true that there is ample Kaffir labor for present requirements, but if a number more gold mines should start up, and there should be anything like an industrial awakening in South Africa, the demand for labor will be so much greater than the supply that we will be face to face with a serious shortage and business would receive a serious set-back.

Much interest is being shown in the Randfontein mines, in the western part of the Rand. These shares are now very popular. About three months ago they were quoted at 20s., while today they stand at 33s. There are vast potentialities at Randfontein. Besides the mines already at work, two huge mills of 300 stamps with tube-mills, are to be erected in the future. At the Randfontein Central mine, when the 300-stamp crushing plant is at work, they expect to get through 63,000 tons per month and make a profit of about 10s. per ton. Farther south the idea is to put up another 300-stamp plant. One is tempted to ask, why not put these plants together and make one of 600 stamps? The mistake of the past has been the small separate reduction plants. Centralization of plants is the best policy for the future.

MEXICO.

Competition in Oil Business.— Oil Development on Isthmus of Tehuantepec. — Smelter at Chihuahua.

Early in February it was rumored in Mexico that we were on the eve of a battle royal for control of the oil market of the Republic between S. Pearson & Son and the Waters-Pierce Oil Co. The Waters-Pierce Oil Co. is a branch of the Standard Oil Co. that has had absolute control of the oil business in Mexico for more than a generation. The firm of S. Pearson & Son was the contractor and builder of the Tehuantepec National railroad. At a number of points on the isthmus of Tehuantepec excellent oil was found by the Company while engaged in construction, and it is now being used by the Tehuantepec National railroad as fuel. The flow from the wells, however, was far in excess of the needs of the railroad, and that it might have a more general commercial value S. Pearson & Son started last year at Minatitlán an immense refinery. This has recently been completed. It has a capacity of 5000 bbl. per day, and in connection with the refinery, storage tanks have been erected with a combined capacity of several hundred thousand gallons. A pipe-line 15 miles long was put in from San Cristóbal, the main oilfield, to Minatitlán, and thence a railroad to kilometre 30 of the Tehuantepec National, giving access to the wharves at Coatzacoalcos. From this point the Company's lighters could convey the oil to any port along the coast, and additional storage tanks of some 50,000 gal. capacity were erected at Vera Cruz to supply the Mexico City market and other territory tributary to Vera Cruz. All this was to be completed, and the break in the market was scheduled to occur in March or April, but those months passed without a ripple. Then in May it was reported that S. Pearson & Son had sold out to the Standard Oil Co. for $35,000,000. The amount seemed reasonable for the Pearson holdings in the States of Chiapas, Campeche, Tabasco, Vera Cruz, San Luis Potosí, and Tamaulipas, on which are held the rights for the exploration of petroleum for 50 years from 1906 under a concession from the Federal Government. By the terms of the contract 7% of the value of the output goes to the Federal Government and 3% to the State in which the oil is produced. But Pearson's relations with the Mexican Government are such that a sale to the Standard Oil Co. did not seem feasible, so it was given out that

a merger had been effected between S. Pearson & Son and Furber (of the Oil Fields of Mexico) and Doheney (representing the Mexican Petroleum Co.), the two largest companies in the San Luis Potosí, Vera Cruz, and Tamaulipas fields. Now, however, it is stated on good authority that S. Pearson & Son has shipped from the Minatitlán refinery three carloads of gasoline and petroleum to Mexico City, and that immediately on its arrival it will be placed on the market at a reduction of 20% from the prevailing prices. The same tactics will be pursued at other points in the Republic. If this is done an oil war will be precipitated at once. It would be a blessing to consumers who have been bled by the Waters-Pierce Co. long enough.

In Chihuahua it is definitely stated that the new plant of the American Smelting & Refining Co., situated on the Rancho de Avalos, six miles southeast of the city, which was completed last December but not blown in, will be started up soon after July 15. The roasters have been in operation since the last of June. On June 10 the Company began the shipment of ores from its mines in Santa Eulalia to the Chihuahua plant. These were followed by ores from Sierra Mojada and Parral. Then, to relieve the Torreón Metallurgical Co. from the embarrassment consequent upon last year's drop in metal prices and its large stock of ores on hand, that Company's ore from Naica, San Francisco del Oro, and other points, has also been taken over, until there are now being received at the Chihuahua plant between 400 and 500 tons per day. At least two furnaces will be blown in. This diversion of the ores to the Chihuahua plant has caused a large decrease in the receipts from Mexico at the El Paso smelting works. The latter plant may have to reduce the tonnage smelted, if there is not an early rise in the price of lead and silver.

JOPLIN, MISSOURI.

Decrease in Production.— Activity at Chitwood and Leadville Hollow. —Discoveries on New Geological Horizon at Cave Springs.

The recent recession in the spelter market, and the consequent collapse of the hopes of many of the zinc-ore producers who had been counting on an advance, has caused discouragement to settle upon the district. The result has been to enlarge the ranks of idle properties. In the Oronogo district, which produces normally in excess of 225 tons per week, only one plant is in operation. This will depress the output below 50 tons per week. In the Webb City camp a large number of mills have closed down indefinitely. The Little Princess, which has been producing steadily throughout the period of low prices, has over 2500 tons of zinc-blende concentrate awaiting a market upon a $40 base. The Aylor properties are likewise piling up a large amount of zinc concentrate, estimated to be in excess of 1800 tons. Outside of these big piles there are scarcely any ore-supplies in the district, as the few other plants that are running have their ore sold every week to the ore-buyers, who readily take what is available at or below $35.

Despite the gloomy outlook for the district a large amount of underground development is still in progress. Many of the companies shutting down their plants continue to employ a portion of their men in development work. New shafts are being sunk, prospect-drifts are being driven, and other work incidental to the development of new reserves. The camps in which the greatest amount of work is in progress are the so-called soft-ground camps, where the ore hoisted carries a high per cent of concentrate. South and southwest of Joplin a large amount of such development is in progress. On the Johnston and Bathe lands five new companies are opening mines at which as many concentrating plants will be erected. In every case the orebody developed was about 100 ft. deep. The ore mined is of the variety called 'free-milling' in this district. Joining these tracts a company is completing the development of a portion of the Reisling land upon which a new 'sheet-ground' deposit was discovered about eight months ago.

Northwest of Joplin there has been considerable activity in the old camp of Chitwood and in Leadville Hollow. The Lounetta and Barnard companies have drilled and developed two very rich deposits of zinc-blende. The first has brought its property to the producing stage, having completed the erection of a small plant which has begun operation. The latter company is yet developing its lease. In the same vicinity the Hermit Mining Co. has opened what appears to be the richest deposit of free zinc-blende yet developed in the Leadville Hollow camp. At a depth of 150 ft. a recent working ran into ore containing from 20 to 30% zinc-blende. The most important development attempted has been in the Cave Springs camp, and north of Galena. What appears to be an entirely new ore-horizon is being opened. The ore lies deeper than elsewhere in the district. In all the holes so far drilled, and in the shafts opened, the ore is found between the 222 and 300-ft. levels. The drill-records show this deposit to be far below the horizon of the Grand Falls chert in which the greater number of the ore deposits of the district occur. As far as known no workable deposits of galena or zinc-blende have hitherto been opened or even seriously considered below the Grand Falls chert. This discovery therefore apparently marks the beginning of an epoch of working deeper orebodies. The deposit is of abnormal thickness, running from 55 to 76 ft., and the ore was imbedded in a soft matrix of dolomitic limestone with a small admixture of chert. The quantity of concentrate from the ore ran high, usually from 4 to 20%. The Herald Mining Co. finally sunk a shaft and upon opening the deposit fully verified the drill-records.

Just north of Empire City and Galena, Robertson & Ping have been drilling on the old Helen Hunt lease. The drill-cuttings showed the same formation at practically the same depth, catching the ore at 222 ft. and maintaining the same depth as at Cave Springs, namely, 300 ft. The ore came far below the Grand Falls chert, and was in the same soft dolomitic limestone. These deposits are in a class by themselves, and will require a revision of theories as to the genesis of the lead and zinc deposits of this field.

BUTTE, MONTANA.

Reins Copper Co.—North Butte Co. — Changes in East Butte Mining Co.—Davis-Daly Estates.—New Installation by Pittsmont Copper Company.

The directors of the Reins Copper Co. have adopted a resolution, which will be submitted to the stockholders at their annual meeting at Butte, August 12, providing for the issuance of $600,000 in first mortgage, 6% gold bonds, maturing in five years from the date of issue, with interest payable semi-annually. The mortgage will cover all the property of the Company in the Butte district, and the bonds are to be issued to pay off the present indebtedness of the Company and provide funds for its future operations. The directors are: J. M. Guffey, E. W. Marland, W. P. DeArmit, A. P. Childs, Jr., T. N. Barnsdall, George D. Prentice, and W. F. Johnson, all of Pittsburg. The Reins Copper Co. owns the Combination and several other mining claims on the east side of Anaconda hill, in Meaderville, and Colonel Guffey and his Pittsburg associates have put up a million dollars or more to purchase and develop the property. The mine was not paying when the financial panic struck Pittsburg, and operations in Butte had to be suspended. An accumulation of debts remained unpaid and numerous attachments were placed on the property.

The North Butte Mining Co. is again mining to the full capacity of its shaft, and is also engaged in cutting skip-pockets and stations at the 2000 and 2200-ft. levels. The first vein north of the shaft will be opened by the station at the 2200, and driving will be done on it as soon as the station is completed. At the 2000-ft. level the vein is about 100 ft. north of the station, and will not be reached by cross-cutting until about a month later. There is no reason to believe that the veins at the 2000 and 2200-ft.

levels will be any smaller or less rich than they are on the 1800, where the principal mining is now being done by the North Butte. Four hundred feet of new stoping ground will be opened by the two new levels, in a comparatively short time.

The main office of the East Butte Mining Co. has been changed from Butte to Boston, in accordance with action taken by the stockholders at the annual meeting on July 8. William P. Everts, Robert H. Gross, and Frank P. Son, of Boston, were elected directors to succeed James A. Talbott and Patrick Wall, of Butte, and the late Henry Mueller. The other directors are Frank M. Sullivan and Charles R. Leonard, of Butte. Mr. Sullivan will also retire as president and will be succeeded by a Boston man. Patrick Wall, general manager of operations since the organization of the Company, has announced his intention to retire from that position as soon as someone else is appointed to the place. Mr. Wall has many other mining interests in Montana and Idaho which claim his attention. The change in the directorate and transfer of the office of the Company is said to indicate that William A. Paine and associates in Boston have secured control of the East Butte Co. They acquired a lot of private stock and also a large block of treasury stock, for which the East Butte treasury received $150,000. In addition to the cash the Company has 60,000 shares of stock remaining in the treasury. The East Butte has a big mine in condition for production, and owns the mineral rights under about 100 additional acres of ground, together with ground for a mill-site and for mining operations, in addition to a large copper precipitating plant.

The Davis-Daly Estates Copper Co. is endeavoring to raise money. About $180,000 was due July 1 on some of the claims, chiefly to the Daly estate, but extensions were secured from the latter. The managers of the estate had no desire to embarrass the Company and would not declare the options forfeited. The Davis-Daly Co. is still working a few men in the Colorado mine, where the shaft is being sunk 200 ft. deeper, from the 1000-ft. level. Prospecting is progressing on the 1000-ft. level, and several good veins have been opened, but they do not contain ore that would return a profit at the present price of copper. Lesees working on some of the Company's claims have stopped. The Hoy lessees on the Lizzie claim quit of their own accord because they could not make money at present copper prices and pay a royalty of 25% in addition. The Hoy lessees developed two fine veins in the Lizzie ground, one vein 20 ft. wide, containing only second-class ore, and another about 3 ft. wide, containing mostly first-class ore. The veins have been developed to a depth of 200 ft. only. The Lizzie is one of the claims purchased from the Daly estate, and on which a large payment is still due.

Because the mill and lumber-men employed by the Amalgamated Copper Co. at Hamilton, Montana, refused to accept a slight reduction in wages the saw-mill at that place has been closed. The Company desired to restore the wages that prevailed before the last raise was granted, a few months before the financial panic. The reduction proposed was 5 to 10c. per day. The employees at the other mills of the Company accepted the reduction and work there continues.

The Pittsmont Copper Co., called a holding company for the Pittsburg & Montana Copper Co., has been organized to finance the latter Company and pay off the almost overwhelming liabilities with which the Company was loaded down during the Baggaley management. The Company owns its own smelter, and during all the panic and shutdown of other mines the Pittsburg & Montana continued mining and production on a small scale, mining only ore that assayed about 7% copper. The Company has just enlarged its smelter-capacity by the installation of a new 250-ton blast-furnace. The old 150-ton furnace will be taken out and another 250-ton furnace put in its place, thus increasing the capacity of the plant to 500 tons per day. A new stand of converters is also being added, and the converter-building is being enlarged and remodeled. A new concentrating mill of 250 tons capacity is being erected, and will be in operation in about two months. Under the management of Oscar Rohn, who has been in charge of the Company since the retirement of Ralph Baggaley, the property of the Company has been improved and systematically developed. The main shaft of the mine is down 1200 ft., and a winze 300 ft. deep has been sunk from the lowest level. There are eight miles of workings and a large amount of good ore has been blocked out. Some of the stopes are 8 ft. wide and full of 7% ore. The present daily output is from 100 to 150 tons, and that will be increased to meet the capacity of the new furnace which will treat 500 tons of ore per day. The Company is capitalized for $30,000,000 in shares of $100 each. It owns about 260 acres of mineral ground on the east side of the Butte district, and about 1110 acres elsewhere in Montana, situated at Helena, Elkhorn, and in the Greenhorn mining district.

Portion of Butte, Montana, Showing Shaft-Houses.

SALT LAKE, UTAH.

Blowing-in of Tintic Smelter.—Dividends Payable.—Bingham & Garfield Railroad Co. Organized.—Godiva Mines.—Tintic and Park City Out-put.

The date fixed for the blowing-in of the new smelter in the Tintic mining district, which has been built by the Tintic Smelting Co., has been fixed for July 24. Only the lead furnaces, however, will go into commission at that time, as the copper end of the plant is not yet ready. The forthcoming event is regarded as auspicious by Tintic mine owners, for the reason that they have been supplied with an independent market for their ores, it being no longer necessary to depend on the two larger smelting concerns for smelting facilities. While the Tintic plant was originally planned to reduce ores coming only from the mines controlled by its builders, the policy of the American and United States Smelting companies in raising treatment charges encouraged the promoters of the Tintic plant to engage actively in the custom smelting business, and no less than $250,000 has already been expended in construction. Ores are now being received and the sampling mill is in operation. Dividends payable in July have been posted by the following Utah companies: Bullion Beck, 10c., $10,000; May Day, 1½c., $12,000; Utah Mine, 3c., $3000; Utah Consolidated, 50c., $150,000. Articles of incorporation of the Bingham & Garfield Railroad Co., have been filed with the proper authorities, the corporation being subsidiary to the Utah Copper Co. While the document indicates that a line 35 miles long, and situated in Salt Lake and Tooele counties, is to be built, that is not taken as an indication that it will be completed in the near future. It is the purpose of the Utah Copper Co. to segregate the railroad from the mining and milling end of the enterprise. The company owns and has equipped approximately 10 miles of standard-gauge track, which will be turned over to the Bingham & Garfield Co. This trackage is in Bingham. It is not expected that the transportation contract of the Utah Copper Co. with the Rio Grande railroad will be abrogated because of the organization of the new company. A controlling interest in the Bingham-Butte mine, in Bingham, has passed to Nicholas Treloar and associates, who will undertake its further development. The consideration is $45,000. Last week's ore and bullion settlements aggregated $432,000 and the stocks sold on the floor of the Salt Lake Stock & Mining Exchange had an aggregate valuation of $500,000. Ore shipments from the Tintic district last week amounted to 74 carloads, the contributing mines and amounts being: Black Jack, 1; Centennial Eureka, 31; Colorado, 4; Eureka Hill, 14; May Day, 8; Uncle Sam Consolidated, 8; Utah Consolidated, 3; Yankee Consolidated, 5. Tintic, next to Bingham, is the most active mining district in the State. With the starting of the new smelter there, the output of the mines will be materially increased. The re-organization of the Godiva Mining Co., and the resumption of development there this week, means that this once noted producer will shortly rank as a regular shipper again. The shaft, down 900 ft., is to be continued to 1300 ft. In the Gemini mine two electric pumps have been recently installed and greater depth is to be gained in that property; the shaft is 1900 ft. deep and is to be continued to 2200. Without a single exception development at 2000 ft. has been splendidly remunerative in showing up good orebodies. The total ore shipments from the Park City mines during June was 5302 tons; the Silver King Coalition and Daly Judge mines being the principal shippers.

Although the Utah Consolidated smelter has been closed for six months, the Company has not entirely escaped attack from farmers residing in the vicinity of the plant. Suits for damages aggregating $20,410 were filed this week. The damage to vegetation alleged is said to have accrued prior to this year. The custom of the mining companies controlled by Jesse Knight and associates in rendering a financial statement at regular monthly intervals is being carried out to the letter. The June reports show: Beck Tunnel, bills payable, $16,005; Black Jack Consolidated, bills payable, $21,129, and an assessment of 3c. per share, Tunnel, bills payable, $16,005; Black Jack Consolidated, cash on hand, $14,348; Colorado Mining Co., bills payable, $38,369; East Tintic Consolidated, cash on hand $1062; Indian Queen Consolidated, cash on hand, $6619; Ibex Gold Mining Co., cash on hand, $32,019; Iron Blossom Consolidated, cash on hand, $39,281; Mountain Lake Mining Co., cash on hand, $25,466: Mineral Flat Mining Co., cash on hand, $1664; Uintah Treasure Hill Coalition, cash on hand, $41,595.

RAWHIDE, NEVADA.

Settling Down to Development Stage.—Account of Leading Properties.

The camp of Rawhide has experienced its boom and has now settled down to the task of developing its mines. The population of the camp has decreased from perhaps 9000, a vast majority of whom were boomers and loafers, to a working body of 2000. It is believed by many that Rawhide will develop a number of low-grade permanent mines.

The Kearns No. 2 M. & L. Co. have a working shaft 380 ft. deep, have cross-cut and proved their ore at the 60-ft. level, also at the 100, 200, and 300-ft. levels. In doing this development work it has taken out and shipped 280 tons which assayed $300.

The Original Rawhide Mining Co., commonly called the Kearns No. 1, has sunk a prospect shaft 125 ft. deep, from the bottom of which ore assaying $40 has been taken. It has now sunk a working shaft 200 ft. deep and is cross-cutting from this level toward the vein.

The Nevada Rawhide Gold Mining Co., known as the Miller lease, has an incline shaft on the vein to the depth of 60 ft. The whole shaft is in ore. Two drifts have been driven from the bottom of the shaft, one 60 ft. to the south and another 45 ft. to the north. A cross-cut from the north drift shows a 6-ft. vein running parallel with the drift, and a cross-cut from the south drift shows a 2½-ft. vein, both of which assay about $50. The company has sunk a working shaft and has driven about 100 ft. of underground workings. The dump contains 450 tons which will probably mill about $50.

The Rawhide Mining & Reduction Co., commonly known as the Murray lease, has a perpendicular shaft 200 ft. in depth. At the 100-ft. level it has cross-cut to the east 80 ft. and to the west 75 ft. At the end of this latter cross-cut there is a vein 12 ft. wide which assays $35 per ton. On July 8 a body of very rich ore was uncovered in the bottom of the shaft, the extent and richness of which have not yet been determined. A shipment of 20 tons has already been made. A 10-stamp mill has been shipped from San Francisco.

The Rawhide Wonder King Combination has opened up a large body of good milling ore, with some shipping ore. The indications are that it will become a large producer. Arrangements are being made to put up a hoist adequate for deep sinking.

The Truett lease, on Hooligan hill, has one shaft 100 ft. and another 70 ft. deep connected by a drift at the 70-ft. level. It has shipped 40 tons of ore to the Nevada Ore Sampling Co., at Hazen, and is now sending from 9 to 10 tons of ore per day to the Gates-Tyrer mill.

The Rawhide Mining & Leasing Co., commonly known as the Big Four, has one shaft 215 ft. and another 50 ft. deep. At the bottom of both shafts are underground workings of a total length of about 350 ft., exposing several veins which assay from $12 to $65.

The Grutt Hill Mint Mining Co. has an incline-shaft 140 ft. deep from the 50-ft. level, of which a 70-ft. drift has exposed a 3½-ft. vein of ore that assays $20. The last 40 ft. of the shaft is in ore that will assay $100. This property has two tons of ore on the dump that will sample $1000 per ton, and numerous other rich specimens have been taken out.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Strength of woods increases with the specific gravity—that is, in general, the heaviest wood is the strongest.

To cut a bottle, fill it with oil up to the line at which it is to be cut, heat an iron rod to a white heat and dip it into the oil.

Washing boilers is best done with hot instead of cold water. Many cracks may be traced directly to the sudden cooling of the shell when cold water has been used, and also hot water is more effective and quicker-acting in removing foreign matter from the boiler.

The first practical rock-drill for hard rock, a pneumatic percussive drill, was designed, not for mining, but for tunneling purposes, by Sommeiller for the Mont Cenis tunnel; priority of conception seems to belong to an American, Fowle, who patented such a drill in 1851, and an Englishman, Bartlett, in 1855; but the Sommeiller machine, designed in 1857, was the first to be actually used, in 1861; it seems to have been first applied to mining at Moresnet, in Belgium, in 1863.

The asbestos used in the United States comes almost wholly from Canada, although this country is the largest manufacturer and consumer of asbestos products in the world. The quantity of asbestos mined in the United States is insignificant and plays no appreciable part in the control of the market. The total output for 1907 was only 653 short tons, being the smallest annual production since 1896. The cause of this decline is found in the better quality and the greater abundance of the Canadian asbestos, which completely dominates the abestos industry of the United States.

The deepest foundations ever put in by the pneumatic process are those of the steel-arch bridge over the Mississippi river, at St. Louis. The caisson of the east abutment was an irregular hexagon in plan, 83 by 70 ft. at the base, and 64 by 48 ft. at the top, and was 14 ft. high. The working chamber was 9 ft. high. The cutting edge finally rested on solid rock 94 ft. below low water. The maximum immersion was 109 ft. 8½ in., requiring an air-pressure of 47.6 lb. per square inch, being a little over three atmospheres and about the greatest pressure under which men can work.

Fire-clay should be tested primarily for fusibility. This may be done with sufficient accuracy for a preliminary examination in an ordinary gas or gasoline-fired assayer's crucible furnace. The clay should be ground to pass 40-mesh, moistened slightly, and kneaded until just enough plasticity is developed to enable it to be molded. It should be made up into pyramids of the same size as 'Seger cones,' which are composed of mixtures of pure alumina with alkalis and metallic oxides so proportioned as to fuse at definite temperatures. These may be ordered from any dealer in assay and chemical supplies. For testing fire-clay use cone No. 22. If the clay under examination passes this test, more elaborate investigation of the chemical and physical properties of the material, requiring the technical knowledge and experience of a specialist, will be necessary.

The base of an oil is said to be either asphalt or paraffin, according as the oil leaves a residue of asphalt or paraffin upon distillation. A paraffin residuum resembles a mixture of lamp-black and wax or tallow, while an asphaltic residuum resembles black pitch. Nearly all asphaltic oils contain paraffin. To test for paraffin, the heavier distillates are cooled in a mixture of ice and salt. If a white solid crystallizes out, it is usually assumed to be paraffin. The crystals may be separated from the cold oil by filtering, with pressure, through a fine wire gauze or cloth. The collected paraffin is washed with a small quantity of gasoline to free it from the heavy oils. Its melting point should be between 40 and 70° Centigrade.

The percentage of sulphur in a burning oil is usually determined by introducing some oil into an Engler lamp, weighing, burning the oil for two or three hours while the products of combustion are drawn through a 5 per cent solution of potassium hypobromite to absorb the gaseous sulphur compounds formed by combustion. The sulphur is found in the solution in the form of potassium sulphate, and may be precipitated as barium sulphate, dried, ignited, and weighed. From the known weight of oil burned, the per cent of sulphur may be calculated. A volumetric method may be used to determine the sulphur, in which case, the gases are absorbed in a measured volume of twentieth normal sodium carbonate solution, and the amount neutralized by the sulphur dioxide found by titrating back with standard acid, using methyl-orange indicator.

Enquiries as to character and attainments of men seeking positions should be answered fully, with conscientious regard both for the rights of the applicant to the benefit of the doubt and to the best word one can truthfully say of him, and for the right of the enquirer to obtain correct information. But as it is seldom possible to know a man's true character, and as a man may display different characteristics at different times, a statement of this kind becomes in effect no more than an opinion. A reply should accordingly be withheld on the ground of probable liability to the enquirer, unless he should incorporate an absolving clause in his letter, such as the following: "Any statement on your part as to the responsibility or standing of this party is a matter of opinion and is given as such and solely as a courtesy, from which no responsibility will in any way be attached to you." This leaves open the possibility of liability to the applicant only, from which no trouble can result if adverse judgment be limited to a simple statement of known and demonstrable fact.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Waters, Meteoric and Magmatic.

The Editor:

Sir—Referring to James F. Kemp's article on 'Waters, Meteoric and Magmatic' in your issue of May 23, I wish to say that Mr. Kemp is mistaken in crediting Elie de Beaumont with being the first to ascribe the formation of orebodies to solutions from magmatic sources. The following quotations are from 'Considerations on Volcanoes,' by G. Poulett Scrope, published in London in 1825:

"It appears then (see p. 209), that of the solutions of continuity which accompanied the process of elevation, whether in the replicated strata composing the mountain or in their more distant prolongation, the deepest and widest were subject to occasional extravasation of the inferior lava bed; and these remain as dikes or intruded beds, penetrating the strata, often connected with an overlying bed of crystalline rock of a similar nature. Others which were too narrow and intricate to allow of the escape of any intumescent matter in a liquid form, were yet permeable to the vapors and metallic sublimates that rose from this subjacent mass, and were partly filled by these, and partly by rubbish; * * * from their sides and from above, thus giving occasion to mineral veins. The formation of calcareous and other breccias, and veined-marbles, is accounted for by the smallness of the fractures. The still unconsolidated juice of the rock oozing into its cracks and crevices, and filling them with a deposit of finer matter."

Again on page 23: "But of what nature is the aeriform fluid which escapes so rapidly from the exposed surface of the lava; the loss of which causes its sudden consolidation? There need by no doubt, at all events, that it is the same fluid which causes the expansion, intumescence, and rise of this substance through the volcanic aperture, until in most cases it overflows the lip of this vent, escapes with violent outbursts from its surface, producing jets of liquid lava and red-hot scoriae. The result of all the experiments and observations that have been made during volcanic eruptions, leads to the conclusion that the elastic fluid which plays so important a part in the phenomena of volcanoes is no other than aqueous vapor or steam." * * * (Page 25) "It appears then from what has been stated above, (1) that the intumescence and rise of lava, within the vent of a volcano, is owing to the explosive force of an elastic fluid generated in its interior, (2) that the violent rise and escape of volumes of this fluid through the columns of lava elevated within the vent produces the jets of lava-drops and scoriae which constitute the principal fragmentary ejecta of a volcano, and (3) that the same rapid escape of this same fluid from the lava, when exposed to the air, effects its instant consolidation. From these and other considerations it appears highly probable that it is the intimate combination of this fluid with the solid crystalline particles of the lava, which occasions their mobility, and the consequent liquidity of the mass. There is every reason to believe this fluid to be no other than the vapor of water intimately combined with the mineral constituents of the lava, and volatilized by the intense temperature to which it is exposed, when circumstances occur which permit of its expansion. When, therefore, I speak of the ebullition of lava, I must be understood to mean the vaporization of water, or part of the water, contained in close union with its solid crystalline particles. In the same manner as wet sand, paste, milk, soup, and so forth, may be made to boil, though it is only the water they contain which is really vaporized."

On page 43 he says: "This escape may take place according to circumstances either: (1) by the rise and absolute expulsion from the mouth of the vent of the liquid lava alone—which consists of an assemblage of crystals of one or more minerals, more or less disintegrated and comminuted, merged in a vehicle of steam, proceeding from the volatilization of the water which was intimately united with their texture, or (2) by the partial elevation, and perhaps expulsion of the lava, and the absolute escape by itself of a certain proportion of the elastic vapors contained in it; which traverse the mass of liquid lava and rise from its surface in consequence of their inferior specific gravity." Again on page 172: "The elevation of islands above the surface of the ocean by the expansion of steam in submarine lava is illustrated by the following: (1) An eruption on St. Michael, one of the Azores, in 1638. Other eruptions took place from the same spot in 1691, and in 1720; which produced an island six miles in circumference. (2) That which gave birth to the Isola Nuova, off Santorini, in the Grecian Archipelago in 1707. Santorini itself is reported by Pliny to have been produced in the same manner in 236 B. C., as well as two other neighboring islets, Jera and Thia. These were enlarged by subsequent eruptions. (3) That of Sobrina, near St. Michael, one of the Azores, in 1811. (4) An island thrown up at some distance from the coast of Iceland during the violent eruption from Skaptar Jökul in 1782. (5) A new volcanic island formed in the Aleutian group near Unalaska in the spring of 1814, called Bojuslaw by the Russian hunters."

On page 223 occurs the following: "The waters of the ocean have two sources, namely, (1) that of land springs, many of which are still thermal, others impregnated with silex and carbonate of lime, and so forth, but in the earlier ages of the globe it is highly probable that the water percolating through the heated crystalline rocks, or produced by the condensation of their vapors, both possessed a higher temperature, and was more impregnated with mineral matter. (2) Rain-water. Rain-water has two sources also: (1) evaporation, by which pure water alone is carried up; (2) volcanic vapors, by which mineral substances, as muriate of soda, lime, and magnesia, and sulphate of sode and lime, are carried up in solution and either mingled with

the water of the ocean if the vent is subaqueous, or carried down into it by condensation of the vapors, if they rise from a subaerial source."

Could anything be plainer than Scrope's expression of the idea that volcanic or magmatic waters are not of surface or meteoric origin. The other quotations show the relation of magmatic waters to volcanic action and hot springs, and particularly on page 223, where he names the two sources of the waters of the ocean and also the two sources of rain-water. Scrope seems to have known more about magmatic waters and its effects than any subsequent writer, and now there appears to be a renascence of his theories and an acceptance of his point of view near the centennial of the publication of his book. He does not appear to have theorized upon the way in which the magmatic water got into the magma. He accepted its presence as a fact to be reckoned with.

HIRAM W. HIXON.

Philadelphia, May 29.

Cornish Pumps.

The Editor:

Sir—'Old Timer, in your issue of May 2, discusses E. P. Jones' description of the pumping plant on the Loddon Valley mine, and singularly he suggests the use of an air-receiver on the ordinary beam-engine type of pumping-plant. Undoubtedly an air-receiver on a pump operated by crank-engines is an advantage, and not only increases the efficiency of the engines and the amount of water pumped, but also relieves the pit work from shock and renders breakdowns less frequent. However, the air-receiver is a failure when used in connection with a pump operated by a beam-engine. At the Loddon Valley mine, in addition to the double pumps operated by the crank and fly-wheel engine there was a beam-engine of which the following are the details:

Diameter of cylinder	108 in.
Stroke	120 in.
Steam press	100 lb.
Lift	460 ft.
Strokes per minute	$8^1/_8$=500 per hour

This engine was bought second-hand because it was more important to get increased pumping capacity quickly than it was to secure high efficiency, and being available it was bought and erected before the manufacturers would have been able to deliver new machinery of the type required. The pump-column was made of sheet steel, and the valves were of a multiple-valve pattern. The same sort of air-receiver described by Mr. Jones was attached to the pit-work. This plant never operated satisfactorily until the air-receiver was taken off. The column-pipe burst several times, as did the air-receiver on several occasions, so badly that it had to be taken to the surface, and sent to the shop in Melbourne 100 miles distant. In each case, needless to say, the plant was idle until repairs were completed. Before proceeding, it is well to recall the action of the beam-engine pump. The rods and plunger in this case, if my recollection serves me, weighed about 35 tons. The engine simply lifts the rods, and at the end of the stroke their weight actuates the plungers, forcing the water up the column-pipe. As is well known, the inertia of the water has first to be overcome, and the rods start down slowly, gain speed quickly, and at the bottom, when the momentum is greatest and the work to be done least, the stroke ends. The water-hammer is apt to be very bad, and may well cause the cracking of the cast-iron valve-pots. With the Loddon Valley beam-engine plant it was found that the water issued from the column-pipe in a succession of waves. For each stroke there were several waves at irregular intervals, bringing different amounts of water. One day it was determined to put a pressure gauge on the air-receiver, and then a rough indicator-card was taken. The result obtained was horrifying. It showed a pressure over 350 lb. per square inch where the hydrostatic head due to height of discharge accounted for only 195 lb. The card showed that there were several waves corresponding to the waves observed at the top of the column. Here was the trouble; a moving hammering mass of water exerting a pressure nearly double that for which the plant was designed. It will immediately occur to the reader to ask, "this being so with a beam-engine plant, why is it not also true for the crank and fly-wheel engine plant?" It can only be explained in this way; with a beam-engine the operating force is the weight of the rods, and only then because their weight is able to overcome the weight of water to be raised. The action starts with a jerk, compresses the air in the receiver quickly, and the air being elastic kicks back hard enough to momentarily arrest the descending plunger, when, its potential energy having exhausted itself, it again submits to compression and the same action takes place, though on a smaller scale, and at this time the largest part of the water escapes. Even after the stroke is finished the whole body of water in the column is in motion, rising and falling with the compression and expansion of the air in the receiver. As soon as the air-receiver was removed from this beam-engine plant, it worked without a hitch. With the crank-engine, the stroke starts slowly and finishes slowly, and having the momentum of the fly-wheel behind it, the stroke is more positive. The compression of the air cannot stop it, and the water does not surge back and forth as with the beam-engine. Hence there is no shock, but the reverse, and it gives a sweet-running noiseless plant,

Leaving aside the question as to the relative merits of the Cornish pump and the steam and electrical pumps, the experience gained on the 'Deep Leads' of Australia would unquestionably favor the use of the crank and fly-wheel engine, compound or triple expansion, running at, say, 125 revolutions, and transmitting the power through rope drives, thence through toothed gears to the rods. The high-pressure high-speed engine gives a good steam efficiency, and the rope-drive has the effect of taking all the back-lash off the engine itself. Where the gear-wheel shaft is direct coupled to the engine-shaft, the backlash inevitable with this class of pumps has a bad effect on the engine itself. The Waihi Gold mine in New Zealand has a large pumping plant.

The engines are of the beam-type, made by Hathorn-Davies, and although they probably give a high steam-efficiency, a mere glance at the two plants will convince an engineer that the type of plant advocated above is preferable. If we were looking at them merely from the standpoint of efficiency, there perhaps would be little choice, but in first cost, cost of foundations, and time required for erection, the advantage is all on the side of the crank and fly-wheel engine. Compared to the electrically operated pump, for moderate depths, there can be absolutely no question that the Cornish pump is the most efficient, other things being equal.

On the Victorian 'Deep Leads' there are two electrically operated pumps, one a Cornish plunger, and the other a three-throw pump underground. Of the two the plunger was more economical than the three-throw, and neither was as cheap as the Loddon Valley steam-driven plant. The electric power used at the Victorian 'Deep Leads' was obtained from a power station four miles away, where there was a first-class plant, operated jointly by three mining companies which shared the expense. The cost of fuel and labor and the general conditions were exactly alike at both properties, yet the advantage lay with the Loddon Valley plant. At some future time I hope to have more to say regarding the relative costs of these plants. The only plant so far erected with rope-drive and with the features suggested above, is that on the Berry United Deep Leads. There are three sets of underground workings at this property driven by the one line of rods, each lifting the water 200 ft., or a total of 600 ft. The plungers are each 26 in. diam. and arranged for a maximum stroke of 10 ft. This, however, is adjustable, and can be set for various lengths from 5 to 10 ft. The height of the working barrel is 17 ft. The suction valve-pot and delivery-valve each weigh 4½ tons, and are 5½ ft. high. The weight of the valve and seat is 15¼ cwt. It is more than an average man can do to lift the clack off its seat. With the windbore, stool, and air vessel, the total weight of each set of workings is 35 tons. The clack itself is a departure from the orthodox practice in pumps of this class, in so far as the double clack is concerned. In action the upper clack opens first, then the bottom clack opens, allowing the large volume required to pass freely. As the plunger retards toward the end of the stroke, the bottom clack settles slowly to its seat, the upper clack remaining open until the finish of the stroke. The valves are so designated as to areas and weights, that simultaneous closing at the end of the stroke is impossible, the object being to minimise the shock. This object has been attained, for it is impossible to detect the beat of the valves by holding the hand to the valve-pot while the pumps are in motion. The pump rod carrying the plungers weighs in all 80 tons, and is 600 ft. long. There are enormous strains consequent upon moving and bringing this gear to rest. The pumps, however, run so smoothly that unless in sight of the rod or plunger an observer would not realize that they were in motion. The engine is a cross-compound type, with the power taken off by a multiple rope-drive. A pair of gears, weighing 20 tons, takes the power from the ropes and transmits it to the pump crank. By means of the usual type of bob the horizontal motion is converted into vertical for driving the pump-rods in the shaft. The bob is made of steel and weighs 24 tons. Steam is provided by a pair of Babcock and Wilcox boilers, with superheaters, having a working pressure of 125 lb. The engines are arranged for condensing, the condenser being of the Admiralty type, and the air-pump and circulating-pump being independently driven. The speed of the engine is controlled by governors instead of by throttling, as is the usual style of pumping-engines. A series of pulleys are provided so that the number of strokes can be maintained at from five to ten per minute, as desired. The speed being controlled automatically by the governor, this gives almost as good a steam economy for the low as for the high speed.

C. S. Herzig.

London, June 5.

Flotation Processes at Broken Hill.

The Editor:

Sir—In your issue of April 11 is an article on 'Flotation Processes at Broken Hill,' from an 'occasional contributor,' which says that the Potter process is now consolidated with the Delprat interests, and that the Delprat process has now become a thing of the past; that the Broken Hill Proprietary is using the Potter process only, and, further, that there is a persistent rumor at Broken Hill that the Proprietary is using two tons of oil per day in this process. Knowing how anxious you are to give correct information in your valuable paper, you will allow me to point out that your correspondent has been misinformed. The Delprat process has put through up to now about 800,000 tons of material, and continues to treat about 1200 to 1500 tons per day, producing about 1 ton of 42% concentrate to every 4 tons of feed. Further, no oil is used at all, and the only pans employed are those patented by myself, and to which the Potter company lays no claim. The process is not "quit dead," but will be dead as soon as we can find one giving more paying results.

E. D. Delprat.

Broken Hill, New South Wales, June 2.

The Mond Nickel Co., operating in northern England, has made remarkable progress recently and further evidence of its prosperity is given by the dividend declared last month. The distribution on the ordinary shares, which a year ago was 12½%, is increased this time to 15%, while the deferred shareholders will receive 48, as against 33%. At the same time £25,000 is placed to reserve, as compared with £20,000, and the balance carried forward is £11,600 larger than last year amounting to £29,900. Considering that the first dividend on the ordinary shares was declared only three years ago, and that two years before then the preference interest was not fully earned, the progress made since the initial difficulties were overcome has been astonishingly rapid.

MINING THE TREADWELL LODE.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

The ore deposits of Douglas island, in southeastern Alaska, which have been made famous by the production of the Alaska Treadwell Gold Mining Co., are interesting to the miner as an example of the exploitation of immense masses of low-grade gold ore. This ore occurs in the form of irregularly lenticular bodies, encased in schist, the quartz itself being a replacement in diorite. But I shall not try to describe the geological features; the purpose of the present article is to give an account of the methods adopted in the mining of wide orebodies without the aid of timbers. Fundamentally, the method of mining used in the Treadwell mines is the application of the overhead system of stoping to an unusually large low-grade deposit of gold ore. The ore is stoped to a maximum width of 250 ft., and it has been removed for a width of as much as 160 ft. for a length of 300 ft. Owing to the diffuse impregnation of the diorite the shape of the cavernous openings made in the course of mining is determined more by the assay of the rock than by any definite boundaries or structural lines. If the quartzified diorite carries $2 in gold, it is ore; if it caries 50 cents, it is waste rock; between these limits there is a line of demarcation made by the fact that the total working-cost is $1.35 per ton.

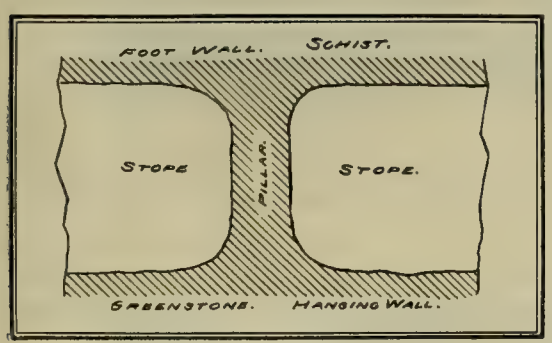


Fig. 1. Vertical Section of a Pillar.

Fortunately, the gold-bearing rock constituting ore will stand without the support of timbers, because it is not only hard but also comparatively free from cross-fractures; and although lime-feldspar exists with the quartz there is not enough of it to cause rapid weathering. To the miner it is 'good ground.' If the lode had a thickness not exceeding the usual stoping width of 4 ft., no precautions whatever would be necessary, but owing to the immense size of the openings made underground in the course of stoping, and the consequent overhang of the rock on the upper side of the lode, there is bound to be heavy pressure and eventual caving, unless pillars are left. The ore has a dip of 50 to 65° northeast, and conforms to the general strike of the country-rock. On the hanging-wall side there is greenstone or gabbro, harder than the schist and limiting the impregnation of gold-bearing quartz southward. On the foot-wall the schist is fissile and soft, the limit of ore is ill-defined, and the ground is heavy. If a small thickness of quartz is left on the 'foot,' the ground stands well, and as the ore is very low-grade it pays to run no risk by stoping too far in that direction.

The stopes are advanced upward in the shape of large rooms separated by pillars. These pillars are from 18 to 25 ft. thick, at right angles to the longer axis of the orebody, and flaring at both walls, as shown in plan in Fig. 1. The idea is to place them in alignment, that is, vertically continuous from level to level. But before describing the stoping, it is necessary to state how the shaft is sunk and stations cut. This is an important matter. The shaft is vertical and in the foot-wall country. When the shaft (10 by 24 ft.) is to be deepened, the first thing is to construct an A-shaped bulkhead of heavy timbers 14 by 20 in. (Oregon fir) across the shaft, covering all of it except a sinking-compartment, which is 4 by 6 ft. inside of timbers. In Fig. 2 the compartment is not shown, as the section is taken across the length of the shaft. The bulkhead is loaded with loose rock to the apex, and as much as 10 ft. over it. Next, the sinking-compartment is put down about 40 ft., and a pillar 20 to 30 ft. high is left for the full width of the shaft and the full length, less the sinking-compartment. This is called the pentice. A recess is cut in the top of this pentice and a tank built with 3 in. plank, tongued and grooved and braced by rods. No cement is used. This tank serves to catch the water dripping down the shaft. On the tank a pump is erected.

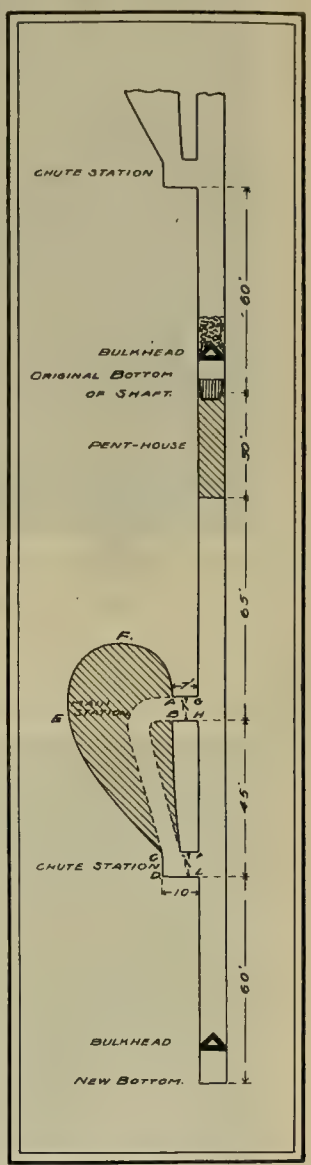


Fig 2. Vertical Section of Main Shaft, Showing Method of Sinking and Cutting Stations.

The top of the pentice is 60 ft. below the floor of the skip-chute station of the last level, the pentice is 30 ft., and the distance from the bottom of the pentice to the floor of the shaft-station is 65 ft. From the shaft-station to the floor of the next skip-chute station is 45 ft., making 200 ft. in all.

The shaft having been sunk 65 ft. below the pentice, two rounds of holes are driven, making a space (A B G H) the size of a drift (7 by 10 ft.) and usually 7 ft. long. This is done on both sides of the shaft. Next, the shaft is sunk 45 ft. and a station (C K D L) cut, 10 ft. deep, and the width equal to the biggest dimension of the shaft. This will be the station for the chute that will load the skips. Now, a raise is put up to connect with the upper opening (A B G H). This establishes ventilation. From the raise the ground is stoped in the form indicated so

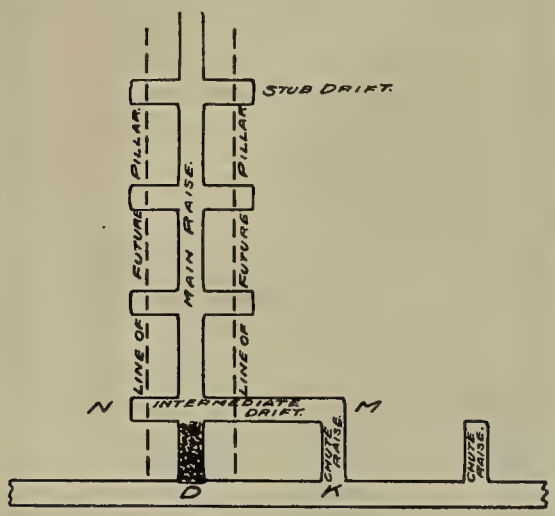


Fig. 4. Vertical Section of System of Raises.

as to make a big pocket (C E B) with a flat arch, which ultimately forms the roof of the station. The distance from B to E is 30 ft. Timbers are placed in position and car-tracks are laid across them. The height of the arch at F is 20 to 25 ft. above the track.

The shaft-stations being completed, a cross-cut (7 by 10 ft.) is started and run through the orebody to the hanging wall, as from A to C in Fig. 3. Where

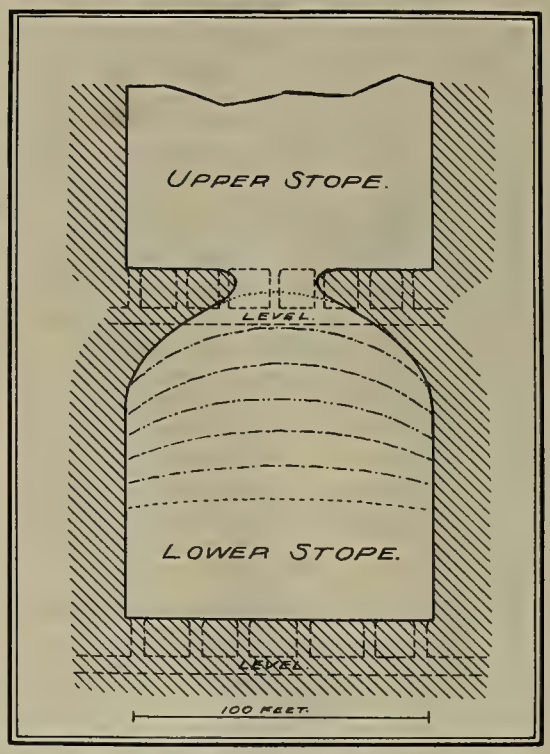


Fig. 5. Vertical Section Showing Condition Between Stopes of Two Levels.

the cross-cut passes through the foot-wall, a drift (7 by 10 ft.) is extended eastward along the foot-wall and partly in it. The position of a pillar having been determined relative to an existing pillar

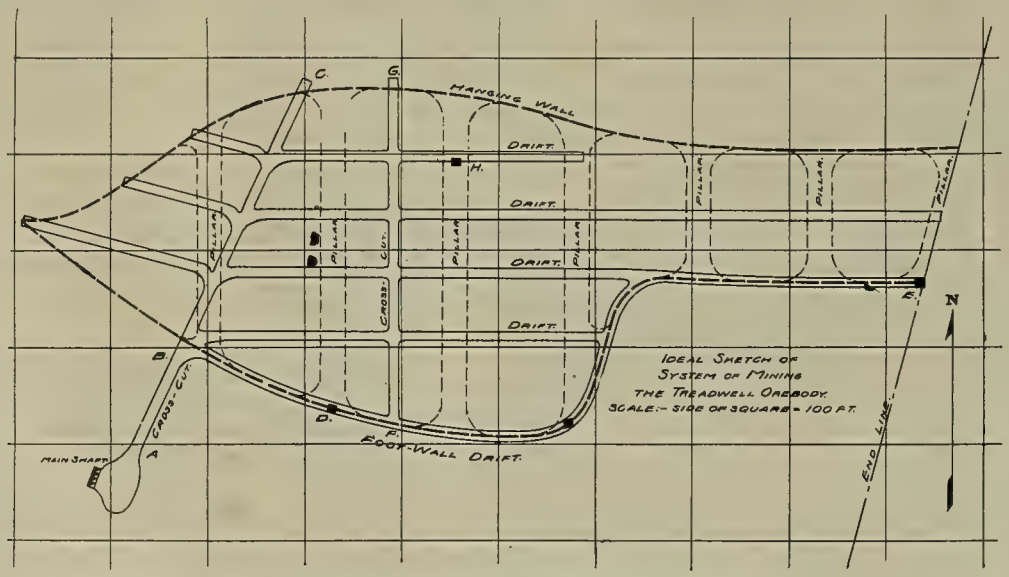


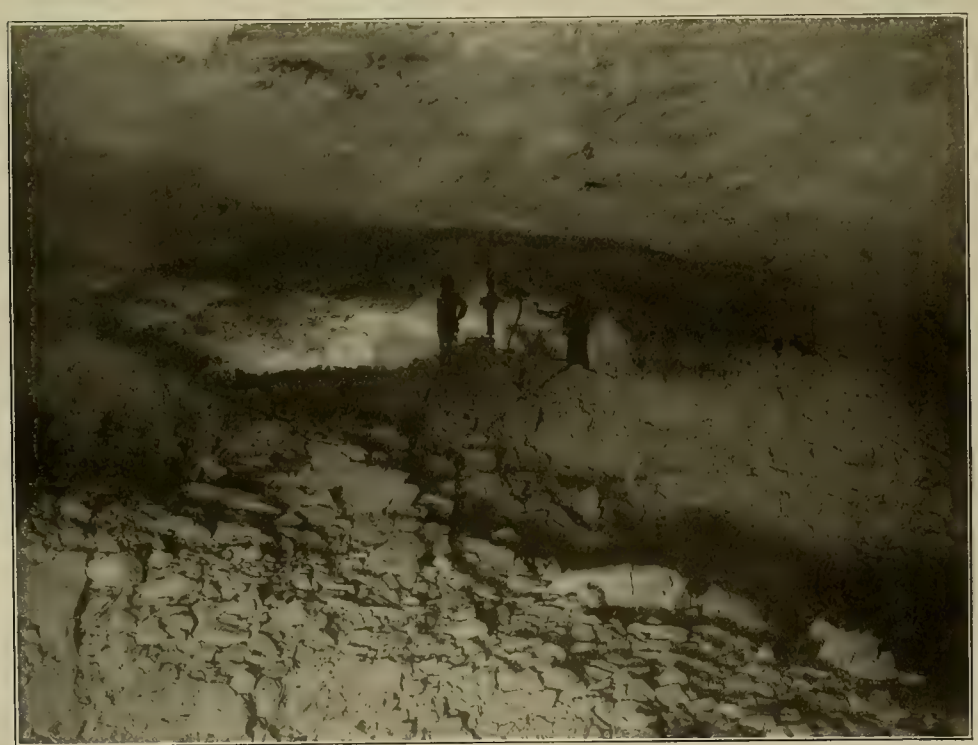
Fig. 3. Plan of System of Mining in the Alaska-Treadwell Mine.

The length of the opening in a direction at right angles to E B is 60 to 80 ft. As soon as the raise has progressed the height of two rounds of blasting, the chute to deliver the ore into the skips is built. A similar pocket for waste is cut on the opposite side of the shaft.

vertically overhead (on a level above), a raise (6 by 7 ft.) is started in this future pillar (at D) and connection is completed with the level overhead, so as to establish ventilation. The levels are 200 ft. apart. Originally they were only 110 ft. apart, but, on account of the cost of opening up successive levels, it

Cutting out Stope, with Opening Around Chute-Raise in Foreground.

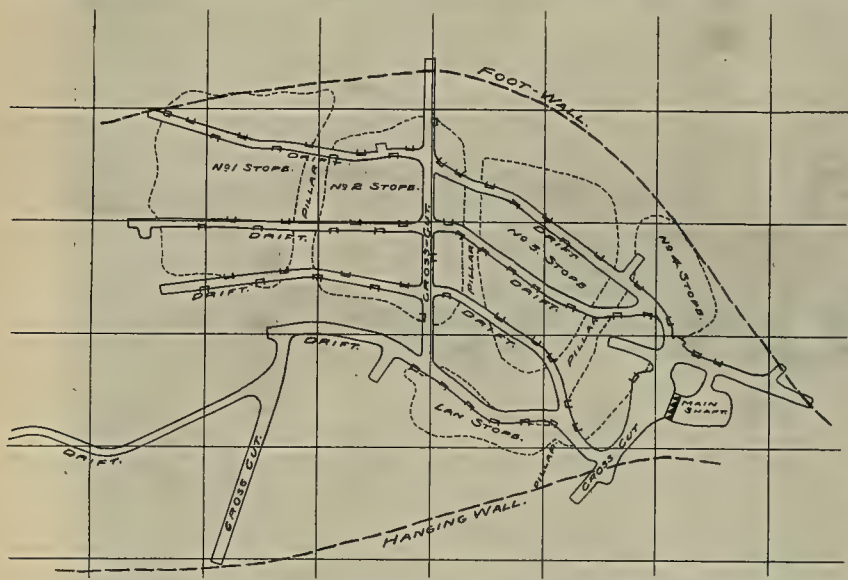
Flashlight Photograph in Alaska Treadwell Mine.



Portion of Stope. Flat Arch of Roof. Machine Set Up on Broken Ore. Alaska-Treadwell Mine.

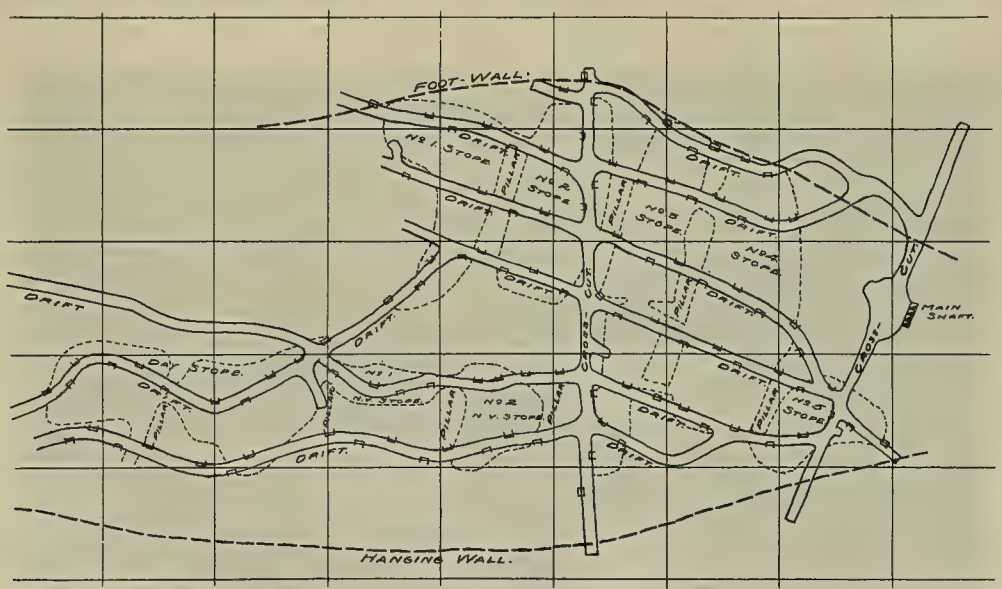
was found economical to increase the interval.

The making of this first raise must be described in detail: The raise is always placed in the pillar nearest the first cross-cut, so as to stimulate ventilation. The main raise is put up 18 to 20 ft.; then on the side farthest from the cross-cut at a distance of 25 ft. from the raise, another raise (K) is made to a height of 18 ft. and an intermediate drift run so as to connect the two raises. See Fig. 4. A chute is then built at the bottom of the first raise (D) and a substantial ladder-way placed in position in the second raise (K) to serve as a man-way for the miners at work in the main raise (D), which is then extended upward. The first section, or bottom 20 ft., of the main raise serves as a pocket for the ore broken in the raise as it is extended upward. As the raise goes up, blind drifts (made by two rounds of holes) are driven on either side at intervals of 30 ft. These serve as stubs for future intermediate levels, and obviate injury to the raise itself from blasting on the stope side, when connection is made with the intermediates.



Plan of 900-ft. Level, Showing Position of Square is Equal to 100 Feet.

The foot-wall drift has been extended to the first pillar, that is, from B to D. The drift is now continued along the foot-wall to the boundary; main raises are made at intervals of 200 ft. and at the boundary (E). All the raises are in ground intended to serve as pillars. At some convenient point, not in a pillar, and usually midway between two pillars, a cross-cut (F G) is driven from the foot to the hanging wall. Next, at intervals of 60 ft., drifts are run in both directions, parallel to each other and to the longer axis of the orebody, as far as the limits of pay-ore, as determined by sampling and assaying. These median drifts connect westward with the first cross-cut from the shaft. From that cross-cut similar drifts are extended to the western limit of the ore. At a point conveniently near the hanging wall, and at about the centre of the orebody, a main raise (H) is made from a drift, in a pillar, to the level overhead, so as to ventilate this part of the mine. From the drifts and cross-cuts, at 25-ft. intervals, blind raises are put up 18 ft. (three rounds of holes); these will serve as chutes, and are termed 'chute-raises.'



Plan of 1050-ft. Level, Showing Position of Pillars and Stopes. Each Side of Square is Equal to 100 Feet.

This finishes the work on the level. All the work is done on contract at an average price of from $8 to $8.50 per foot of drift, cross-cut, and raise. The man-way raise costs $10 for the first 100 ft., and $11 for the remainder.

The lowest portion of the main raise (D) is now emptied, (Fig. 4), so that the ladder-way can be carried down to the level itself, instead of to the intermediate drift, as heretofore. A machine (M) is now put to work on the intermediate at the top of the chute-raise and also (N) at the breast of the stub drift on the other side of the pillar. As space is cleared other machines are brought into service. Thus a cutting-out stope is carried forward with a height of 8 ft.; it breaks successively into the tops of the various chute-raises and is extended as a floor until it reaches the next pillar and then northward to the limit of the ore. The ore broken in this cutting-out stope has to be shoveled into the chute-raises, from which the ore is drawn into cars and taken to the surface. The chute-raises are kept full, to protect them.

Before stoping the 'back' over the cutting-out floor, it is the custom to enlarge the tops of the chute-raises so as to make a funnel-shaped opening. This is done with machines on a tripod. This first stope is now ready for back-stoping. In enlarging the stope upward, connection is made with the stub drifts driven from the main raise, as previously described.

In beginning to back-stope, the machines are set up in the centre and a cut is taken for the full length of the stope, so as to begin to shape the roof in the form of a flat arch. Then the ground is broken both ways toward the pillars, each successive cut tending to maintain the arch with which the stope was started. As the ore is broken down and the larger fragments reduced by sledge-hammers and 'bulldozing,' it accumulates. One third of the broken ore can be removed and yet leave sufficient in the stope to fill all the cavity, save that needed for working. When in place 12½ cu. ft. of ore will weigh one ton; when broken, this ton of ore will occupy 16 to 18 cu. ft.; thus, the broken ore requires one third more space than the unbroken. This ratio is maintained throughout the mine.

The stope is gradually extended until it breaks into the level overhead, but the opening is restricted so as to flare the top of the pillar and leave a shelf projecting around the stope. The top surface of this shelf is the cutting-out floor of the stopes as started at the upper level. See Fig. 5. These shelves are called 'sheet-pillars,' but they are truly pentices, for they are intended to protect the men occasionally at work in the stope underneath during the process of drawing the broken ore.

The pillars are 100 ft. apart, centre to centre. A main raise, with man-way, is made in alternate pillars. While the chute-raises are intended to be 25 ft. apart, they are placed so as to be of maximum service in working any given block of ground and they are pointed at different angles, to accomplish their purpose. It will be understood that the system is modified according to varying conditions, for instance, if a horse or wedge of barren rock divides an orebody, the drifts are driven at wider intervals, and the spacing, height, and angle of the chute-raises is so adjusted as to obviate excessive shoveling of ore in the stopes. As far as possible, all drifts are driven in ore, so that unproductive development work is reduced to a minimum. Of course, only an experienced mine manager knows how to modify such a system to local necessities; without proper knowledge any system is certain to be a snare and delusion.

The practical application of this system of mining is shown by the plans of the 900 and 1050-ft. levels of the Alaska-Treadwell mine. On the 900-ft. level, the ore-mass is as much as 250 ft. wide on the south orebody; there are four parallel drifts, one main cross-cut, and another cross-cut on the edge of the orebody in front of the shaft, which happens to be in ore. Four rooms have been excavated, these are known as No. 1, No. 2, No. 3, and No. 4; they are 120, 130, 100, and 60 ft. lengthwise, and 150, 170, 180, and 200 ft. across, respectively. The pillars are approximately 18 ft. thick, flaring notably in their approach to the sides of the stopes.

For the details of this description I am indebted to the courtesy of Robert A. Kinzie, general superintendent of the Alaska Treadwell Gold Mining Company.

STEAM-PIPE COVERING IN A WET SHAFT.

Written for the MINING AND SCIENTIFIC PRESS
By E. P. KENNEDY.

In order to obtain a covering more substantial and effective than the magnesia covering commonly used, I recently adopted wood-stave pipe, the internal diameter of which was somewhat larger than the external diameter of the steam line. The individual staves were thoroughly painted before using. The steam-line was wrapped with asbestos paper, held in place with string, and then the wood staves were placed around the pipe and drawn to place by a clamp at each end. Galvanized iron-wire was then wrapped spirally around the staves, and made fast by staples, driven into the wood. The clamps were then removed to proceed with the next section. The labor in putting the staves on is probably a little more than that required for adjusting regular pipe-covering, but, by having the clamps which pull the staves into position hinged on one side, and provided on the other with a swing-bolt, the staves can be put on quite rapidly. The cost of material is less than one-fourth as great as magnesia pipe-covering.

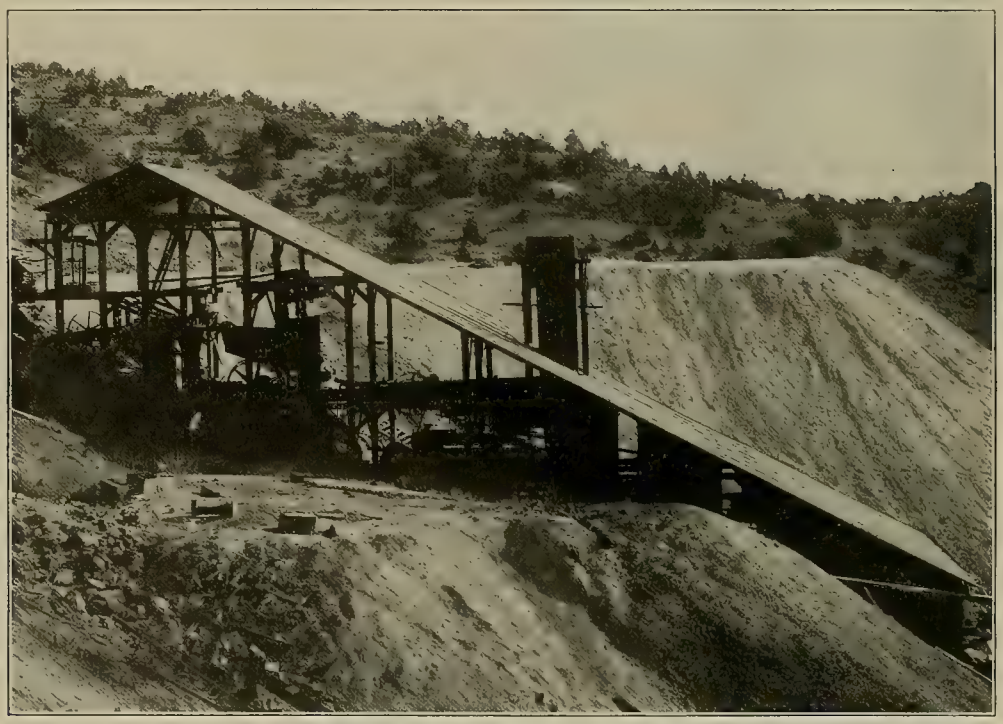
No attempt was made to compare efficiencies. However, by using wood-staves of a diameter larger than the iron pipe, and by using asbestos rings or gaskets between the iron and the wood-pipe a dead-air space is obtained, which is the effect aimed at in all of the pipe-coverings on the market. Magnesia pipe-covering can be protected more or less effectually by a housing of tin or galvanized iron. This is done at considerable extra expense and with not always satisfactory results. The wood-stave covering, on the other hand, will withstand a great deal of rough usage, and is exceedingly durable.

EXPERIMENTAL MILL OF THE NEVADA CONSOLIDATED COPPER COMPANY.

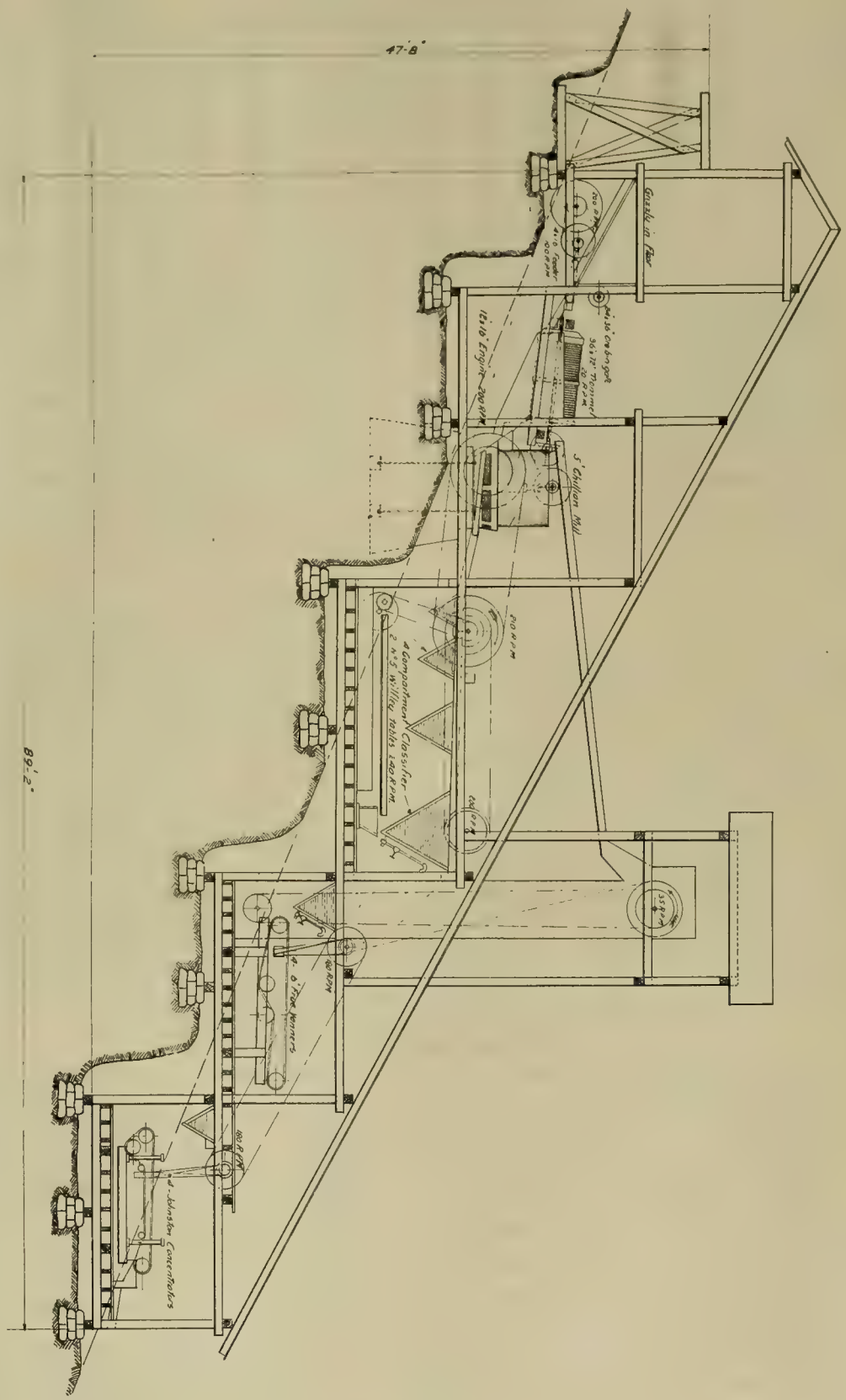
Written for the MINING AND SCIENTIFIC PRESS
By M. L. REQUA.

The two problems that were necessary of solution before the future of the Ely district could be assured were, first, tonnage, and secondly, the concentrating value of the ore. The district was remote from railroad transportation. Eureka, then the nearest railway station, is 85 miles to the west, but railway construction from that point was never seriously considered, because of the much more favorable though longer route from Cobre, on the Southern Pacific, 140 miles north of Ely. This road follows the Steptoe valley, has a maximum grade of 0.7%, maximum curves of 6°, and practically neither cuts nor fills. Against this the Eureka route would have had four summits to cross, with a maximum grade of 4%. The investment was of necessity large in order to put the property on a producing basis, and it was not conservatism to leave anything to chance. It meant at least $2,000,000 in the railway, $2,500,000 in plant, and $500,000 for mine equipment, or a total of $5,000,000.

To justify this investment for a deposit of low copper content, demanded millions of tons of developed ore, and absolute knowledge as to its concentrating value. The question of smelting was not one that needed actual demonstration, as it was well known what could be done with such concentrate, but while similar ore was being concentrated in other places and the results known, it was deemed necessary, in order to make possible the financing, that a small experimental concentrating mill be erected and actual tests made. The ores of the Ely district, as is now well known, are almost entirely concentrating. The amount of direct-smelting ore developed is comparatively small and insignificant. The future of the camp is dependent entirely upon success in concentrating its ores to a satisfactory saving. A small experimental mill was erected at the collar of the Ruth shaft. This mill consisted of a grizzly, on which the mine-car was dumped and the larger lumps of ore broken by hand. From the ore-bin the ore was fed by a plunger feeder into a trommel. For the purpose of experimenting, screens of various sizes were used, and it is probable that some of these experiments were not wisely made, and this is one of the reasons for believing that in a large mill, properly tuned up, the saving will be in excess of that secured in this small plant. The oversize from the trommel went into a three-foot Huntington mill; the undersize was carried around the mill and joined the mill-discharge just before entering the first compartment of the classifier. The first-compartment product of the classifier was fed to a Wilfley table, the tailing from which was elevated and returned into the Huntington and re-ground. The second-compartment product of the classifier was fed to a corrugated-belt Frue vanner, the tailing from which was re-treated on a smooth-belt machine. The third and fourth-compartment products of the classifier went directly to either a smooth-belt Frue or a Risdon-Johnston vanner. Round-tank slime was re-treated upon a Risdon-Johnston or a Frue. This gave practically a double treatment throughout the plant, and while not constructed with any idea of economy or



Experimental Mill, Nevada Consolidated Copper Company.



Section Through Experimental Mill, Nevada Consolidated Copper Company.

DETAILS OF TESTS ON 200-FT. LEVEL.

Date, 1904.	Lot, No.	Dry Crude Ore, Lb.	Crude Copper, %	Copper Tailing, %	Approximate Extract, %	Dry Concentrate, Lb.	Copper Concentrate, %	Crude Copper, Lb.	Copper Concentrate, Lb.	Actual Extract, %	Ratio.	Shovel-Sample Copper, %	Shovel-Sample Copper, Lb.	Map-Average,	Average Copper, Lb.
Nov. 9	36	12,600	3.29	1.10	66.60	2,031	14.28	414	290	70.05	6.21:1	3.59	452	4.45	560
" 10	37	12,950	2.37	0.45	81.01	1,857	13.39	307	249	81.11	7.00:1	2.85	369	2.93	379
" 11	38	13,937	2.52	0.62	75.40	2,159	12.10	351	261	74.36	6.45:1	2.77	384	2.50	348
" 12	39	10,290	2.16	0.54	75.00	1,525	11.65	221	177	79.73	6.75:1	2.25	231	2.55	262
" 24	50	11,936	2.48	0.78	68.55	1,725	10.60	296	183	61.82	6.91:1	2.62	312	2.32	276
" 25	51	12,700	3.29	1.01	68.30	1,935	14.27	418	276	66.03	6.51:1	3.27	415	3.85	478
" 26	52	10,949	2.19	0.56	74.43	1,507	11.60	240	175	73.00	7.26:1	2.20	240	1.91	237
" 27	53	11,472	1.84	0.32	82.60	1,373	12.15	211	169	80.00	8.35:1	2.09	239	2.17	248
Total		96,834	20.14	5.38	591.89	14,112	100.04	2,458	1,780	586.10	55.43	21.64	2,642	22.68	2,788
Averages		12,104	2.52	0.67	73.98	1,764	12.50	307	222	73.26	6.93:1	2.70	330	2.83	348

RECAPITULATION: 200-FT. LEVEL.

Per cent copper in crude ore as per above average map-average	2.83	Lb. copper concentrate as per above statement	1,780.00
Per cent copper in crude ore as per above average shovel-sample	2.70	Lb. copper lost in tailing (2458—1780)	678.00
Per cent of copper in crude ore as per above average mill-head	5.25	Per cent apparent extraction as per above average	73.98
Per cent copper in crude ore as per lb. copper in crude ore (2458×100÷96,834)	2.54	Per cent actual extraction as per above average	73.26
Per cent copper in tailing as per above average	0.67	Per cent actual extraction as per lb. copper (1780×100÷2458)	72.40
Per cent copper in tailing as per lb. copper lost (2458—1780)×100÷96,834	0.69	Per cent actual extraction as per lb. copper sample-shovel (1780÷2642)	67.38
Dry lb. concentrate produced as per above statement	14,112.00	Per cent actual extraction as per lb. copper in map-average (1780÷2788)	63.48
Lb. copper in crude ore as per above statement	2,458.00	Number of lineal feet of cross-cuts and drifts mill-tested	520.00
		Pounds of crude ore milled per lineal foot	186.00

DETAILS OF TEST ON 300-FT. LEVEL.

Date, 1904.	Lot, No.	Dry Crude Ore, Lb.	Crude Copper, %	Copper Tailing, %	Approximate Extract, %	Dry Concentrate, Lb.	Copper Concentrate, %	Crude Copper, Lb.	Copper Concentrate, Lb.	Actual Extract, %	Ratio.	Shovel-Sample Copper, %	Shovel-Sample Copper, Lb.	Map-Average,	Average Copper, Lb.
Oct. 23	19	11,373	1.79	0.26	85.47	1,250	12.90	203	161	79.63	9.10:1	1.93	219	2.95	335
" 24	20	10,220	1.57	0.32	80.20	1,025	13.39	160	137	85.62	10.00:1	1.99	203	2.20	225
" 25	21	11,771	2.10	0.44	80.00	1,523	15.81	247	240	97.16	7.72:1	2.59	304	2.64	310
" 26	22	11,411	2.47	0.38	84.61	1,382	17.00	281	235	83.33	8.26:1	2.75	314	3.27	373
" 27	23	11,574	2.21	0.68	69.23	1,402	13.65	256	191	74.64	8.26:1	2.21	256	3.46	400
" 28	24	12,574	2.37	0.67	71.73	1,864	13.64	298	254	85.90	6.74:1	3.02	380	2.46	309
" 29	25	11,023	1.49	0.51	65.77	1,718	8.90	164	152	92.67	6.41:1	2.03	224	2.24	247
" 30	26	11,653	2.48	0.62	75.00	1,658	12.98	289	215	74.40	7.03:1	2.98	347	2.92	340
" 31	27	11,900	1.90	0.47	75.26	1,504	11.93	226	179	79.20	7.98:1	2.02	240	2.09	249
Nov. 1	28	10,127	2.18	0.75	61.57	1,731	8.46	220	146	66.36	5.90:1	2.45	248	2.87	291
" 2	29	10,645	4.50	0.79	82.44	2,510	15.37	479	386	80.58	4.24:1	4.67	497	3.56	379
" 3	30	9,795	2.02	0.37	81.68	1,765	10.04	197	171	89.84	5.51:1	2.19	214	2.42	237
" 4	31	9,690	2.12	0.36	87.73	1,618	10.00	205	162	79.02	5.99:1	2.34	226	2.56	248
" 5	32	11,228	1.80	0.37	79.50	1,752	9.30	202	163	80.60	6.53:1	2.04	229	2.02	226
" 6	33	9,254	2.25	0.53	74.27	1,475	10.97	208	162	77.88	6.29:1	2.21	204	2.03	187
" 7	34	13,580	4.15	1.67	59.76	2,707	10.22	563	330	58.61	5.02:1	4.15	563	3.33	452
" 8	35	11,358	1.85	0.35	75.68	1,946	8.37	210	163	77.62	5.84:1	2.00	227	2.28	258
Total		189,176	39.25	9.59	1,289.90	28,830	202.93	4,408	3,459	1,363.06	116.82	43.57	4,895	45.30	5,066
Average		11,128	2.31	0.56	75.88	1,696	11.94	259	203	80.18	6.87:1	2.56	288	2.66	298

Composite lot, 29,094 lb., 11.86% Cu, 20% Fe, 25% S, 39.5% SiO_2.

RECAPITULATION: 300-FT. LEVEL.

Per cent copper in crude ore as per above average shovel-sample	2.56	Lb. copper in composite lot (29,094, at 11.86% Cu)	3,451.00
Per cent copper in crude ore as per above average mill-heads	2.31	Lb. copper in concentrate as per above statement	3,459.00
Per cent copper in crude ore as per lb. copper in crude ore (4408÷189,176)	2.33	Lb. copper in crude ore as per above statement	4,408.00
Per cent copper in crude ore as per lb. copper in shovel-sample (4895÷189,176)	2.58	Lb. copper lost in tailing (4408—3451)	949.00
Per cent copper in crude ore as per lb. copper in map-average (5066÷189,176)	2.67	Per cent apparent extraction as per above average	75.88
Per cent copper in tailing as per above average	0.56	Per cent actual extraction as per above average	80.18
Per cent copper in tailing as per lb. copper lost (949÷189,176)	0.50	Per cent actual extraction as per lb. copper (3459÷4408)	78.48
Dry lb. concentrates produced as per above statement	28,830.00	Per cent actual extraction as per lb. copper in composite lot (3451÷4408)	78.29
Dry lb. concentrates produced as per composite lot	29,094.00	Per cent actual extraction as per lb. copper in shovel-sample (3451÷4895)	70.44
		Per cent actual extraction as per above average map-average (3451÷5066)	68.12
		No. of lineal feet of cross-cuts mill-tested	840.00
		Lb. crude ore milled per lineal foot	225.00

DETAILS OF TESTS ON 500-FT. LEVEL.

Date, 1904.	Lot, No.	Dry Crude Ore, Lb.	Crude Copper, %	Copper Tailing, %	Approximate Extract, %	Dry Concentrate, Lb.	Copper Concentrate, %	Copper Crude Copper, Lb.	Concentrate, Lb.	Actual Extract, %	Ratio.	Shovel-Sample Copper, %	Shovel-Sample Copper, Lb.	Map-Average, Copper,	Average Copper, Lb.
Sept. 11...	1	32,570	3.235	1.29	60.00	4,237	16.10	1,054	682	64.70	7.68:1	3.40	1,117	3.49	1,136
" 14..	2	29,296	5.315	0.97	79.90	6,714	18.57	1,557	1,247	80.00	4.36:1	5.48	1,605	5.57	1,632
" 24...	3	140,204	2.800	0.67	76.00	21,088	13.05	3,925	2,752	70.00	6.65:1	2.97	4,164	3.06	4,290
" 27...	4	19,350	3.200	1.46	54.40	3,154	10.68	619	337	54.50	6.14:1	3.37	652	3.46	659
" 30...	5	14,264	1.240	0.64	48.40	2,070	6.40	176	132	75.00	6.90:1	1.41	201	1.50	213
Oct. 3...	6	31,835	2.600	0.44	83.36	4,209	16.71	830	703	82.29	7.56:1	2.77	881	2.86	910
" 4...	1	11,495	5.050	0.98	80.59	2,680	17.57	580	471	81.21	4.25:1	5.40	621	4.85	557
" 5...	2	11,767	1,910	0.85	55.50	1,728	5.43	224	94	41.96	6.81:1	1.89	222	2.22	261
" 6...	3	12,200	1.960	0.53	72.90	1,681	7.89	239	133	55.65	7.25:1	2.00	244	2.27	276
" 7...	4	12,620	1.910	0.32	83.20	2,228	9.76	241	217	85.90	5.66:1	2.00	252	2.42	305
" 8...	5	10,648	2.400	0.24	90.00	1,470	14.40	255	212	87.00	7.24:1	2.50	266	2.93	312
" 9...	6	10,825	2.700	0.51	81.11	1,715	14.27	292	244	83.56	6.31:1	2.70	292	3.20	346
" 10...	7	10,830	2.600	0.47	82.00	1,500	13.80	281	207	73.70	7.22.1	2.77	300	2.53	274
" 11...	8	12,272	1.860	0.37	80.10	1,206	13.55	228	163	71.50	10.17:1	2.00	245	2.18	267
" 12...	9	12,322	2.190	0.56	74.42	1,642	14.15	270	232	85.92	7.50:1	2.44	301	2.28	281
" 13...10		11,877	2.710	0.82	70.00	1,925	11.93	322	230	71.46	6.17:1	2.89	343	3.14	373
" 14...11		11,622	1.700	0.49	71.17	1,667	8.47	197	141	71.57	6.96:1	1.73	211	2.48	288
" 15...12		11,137	1.870	0.38	79.68	1,461	12.29	208	179	86.05	7.62:1	2.11	201	1.98	220
" 16...13		12,215	2.440	0.36	85.00	1,582	14.55	298	230	77.19	7.72:1	2.86	349	2.82	344
" 17...14		11,752	2.410	0.38	84.23	1,545	16.00	283	247	87.27	7.61:1	2.48	291	2.65	311
" 18...15		11,636	1.980	0.24	87.87	1,223	14.30	230	175	76.08	9.52:1	2.10	244	1.90	221
" 20...16		11,490	1.830	0.35	80.00	1,428	11.03	210	158	75.24	8.04:1	1.91	219	2.14	246
" 21...17		11,458	3.050	0.70	77.00	1,492	19.50	350	291	83.14	7.68:1	3.59	411	2.83	324
Total		465,685	58.960	14.02	1,736.83	69,648	300.40	12,869	9,477	1,720.89	163.00	62.78	13,632	64.76	4,046
Average			2.560	00.61	75.51	.....	13.06	.....	....	74.79	7.09:1	2.73	.....	2.81	....

Composite lot, 71,323 lb., 14.76% Cu, 22% Fe, 27.5% S, 30% SiO_2.

RECAPITULATION: 500-FT. LEVEL.

Per cent copper in crude ore as per above average shovel sample	2.73
Per cent copper in crude ore as per above average map average	2.81
Per cent copper in crude ore as per above average mill-heads	2.56
Per cent copper in crude ore as per lb. Cu in crude ore (12,869÷465,685)	2.76
Per cent copper in tailing as per above average	0.61
Per cent copper in tailing as per lb. copper lost (12,869—9,477)÷465,685	0.72
Dry lb. concentrate produced as per above statement	69,648.00
Dry lb. concentrate produced as per composite lot	71,323.00
Lb. copper in crude ore as per above statement	12,869.00
Lb. copper concentrate as per above statement	9,477.00
Lb. copper in composite lot	10,527.00
Lb. copper lost in tailing (12,869—10,527)	2,342.00
Per cent apparent extraction as per above average	75.51
Per cent actual extraction as per above average	74.79
Per cent actual extraction as per lb. copper (9477÷12,869)	73.64
Per cent actual extraction as per lb. copper in composite lot (10,527÷12,869)	81.80
Per cent actual extraction as per lb. copper in shovel sample (10,527÷13,632)	77.22
Per cent actual extraction as per lb. copper in map average (10,527÷14,046)	74.94
No. of lineal feet of cross-cuts sampled and milled	825.00
Lb. of crude ore milled per lineal foot	564.00

FINAL SUMMARY OF RECOVERY TRIAL.

Total lb. of dry crude ore delivered to mill.	751,695.000
Total lb. of concentrate produced	114,529.000
Ratio of concentration	6.56:1
Total lb. of copper in crude ore as per shovel-sample	21,169.000
Total lb. of copper in crude ore as per mill-heads	19,735.000
Total lb. of copper in concentrate as per composite lots	15,758.000
Total lb. of copper in tailing as per shovel-sample	4,411.000
Total lb. of copper in tailing as per mill-heads	3,977.000
Per cent copper in crude ore as per shovel-sample	2.815
Per cent copper in crude ore as per mill-sample	2.625
Pounds copper per ton of crude ore as per shovel-sample	56.300
Pounds copper per ton of crude ore as per mill-heads	52.500
Pounds copper recovered as per composite lot samples	41.930
Per cent copper lost in tailing as per shovel-sample	0.580
Per cent copper lost in tailing as per mill-heads	0.530
Per cent actual extraction as per daily shovel-sample	74.500
Per cent actual extraction as per daily mill-heads	79.700
Total number of feet of cross-cuts and drifts sampled and milled	2,185.000
Average number of pounds of ore taken per foot of cross-cuts and drifts	344.000

expectation that a profit would result commercially, the mill undoubtedly gave a very fair test as to what could be expected from the ores when treated on a large scale in a mill fully equipped for handling the ore in the most economical manner. The test also resulted in a complete re-sampling of the mine in sections of practically 30 or 40 ft. Each level was taken by itself, and the test made consisted of ore taken along a drift or cross-cut as nearly equal as possible over a length of 30 or 40 ft. Every eighth shovelful of this ore was thrown upon a sample-sheet at the head of the mill, and at night before the mill was finally closed, this sample was coned and quartered in the usual way, and the remaining portions of the sample put through the plant. The mill was sampled every half-hour, and thoroughly cleaned up every night; that is, samples were taken of the feed into the first compartment of the classifier, of each machine-heads and tails, of the round-tank slime, and of the tailing down the canyon. These samples were carefully decanted, dried over night, and assayed the following day. The mill was operated for two or three days before being put in regular commission on September 11, 1904, and was operated daily thereafter until December 1, during which time 48 separate recovery-trials were made. The results on all of these tests are set forth in the table herewith. The percentage of copper in the shovel-sample refers to the percentage in the shovel-sample, being every eighth shovelful of ore that was shoveled onto the grizzly. The map-average refers to the samples that were taken from day to day as the mine was developed, over every five-foot section. It will be noted that the map-average is somewhat higher than the shovel-sample, and considerably higher than the average of the percentage of copper in the crude ore, which was the sample taken every half-hour from the spout of the Huntington as it discharged into the first compartment of the classifier. A daily detail-sheet was compiled showing the work of each machine, a copy of one of which is presented hereto. Unfortunately, this is the only detail-sheet in existence, the originals all having been destroyed in the San Francisco fire.

It is an interesting fact that the result of some 150 assays made by the cyanide method, and compared with the same number from the same pulp made by the iodide method, showed a variation of 0.12%, the iodide being the greater. Cyanide was found to be entirely satisfactory on low-grade mate-

DAILY ASSAY REPORT.

EXPERIMENTAL MILL.

Run November 25, Lot No. 51. Ruth, Nevada, November 27, 1904.

	Copper %	Concentrate Produced Lb.	Cars Crude Ore.	Gross Weight Lb.	Moisture %	Net Weight Lb.	Copper %
General Head—Shovel-sample	3.27		7	13,439	5.50	12,700	3.29
Mill-head	3.29						
			Concentrate	2,257	14.25	1,935	14.27
General Tailing	1.01						
General Concentrate							
Apparent recovery, %	69.30						
Wilfley:							
Head	3.13						
Tailing	2.44						
Concentrate	12.69	900					
Middling	14.88						
Slime	2.06						
Apparent recovery, %	22.00						
Frue No. 1:							
Head	2.47						
Tailing	1.45						
Concentrate	15.37	600					
Slime	....						
Apparent recovery, %	41.00						
Frue No. 2:							
Head	1.37						
Tailing	0.80						
Concentrate	6.95	150					
Slime	....						
Apparent recovery, %	41.00						
Johnston No. 1:							
Head	1.78						
Tailing	....						
Concentrate	14.76	600					
Slime	....						
Apparent recovery, %	....						
Johnston No. 2:							
Head—Slime tank	1.64						
Tailing	1.07						
Concentrate	6.95	200					
Slime	....						
Apparent recovery, %	35.00						
V Tank:							
Elev. returns	2.83						
Compartment No. 1	....						
Compartment No. 2	....						
Compartment No. 3	....						
Compartment No. 4	....						
Compartment No. 5	....						
Round Tank Slime	1.64	2,450					

SCREEN ANALYSIS.

ELEVATOR RETURNS.

Mesh.	Weight %	Copper %	Total Copper %
On 20	12.6	2.39	10.9
On 30	12.4	2.54	11.4
On 40	19.2	2.50	17.3
On 60	18.4	3.06	20.0
On 80	5.7	4.10	8.4
On 100	5.0	3.90	7.0
On 200	8.7	2.84	8.9
On 200	18.0	2.45	16.1
	100.0		100.0

SCREENS USED.

Trommel, 3 mm. Mill, 3 mm.
Wilfley, 1 mm.

rial, but upon the concentrate it was found that the results were erratic and always low, although in some cases the variation was very slight. Sixteen of the lot-samples were sent to the Tennessee Copper Co. to be assayed by the electrolytic method. By this method lots No. 2 and 3 were found to contain 1.65% and 1.92%, respectively, more copper than our assays showed. Of the 16 samples sent to the Tennessee Copper Co., 15 ranged from 0.61 to 2% higher in copper than we had been able to get by the cyanide assay on the ground in Nevada. It is possible that some of the variation between the map-average and the mill-head may have been due to the fact that there was a certain amount of soluble copper in the water, which was precipitated upon the iron through the mill, or went down the canyon with the tailing.

I believe unquestionably that in the large mill now being built these results will be materially bettered, as it was not possible to treat the products of various sizes from our classifiers as we would like to have done, nor was it practicable to put in re-grinding machines for re-grinding the coarser products, owing to the fact that the fall between the top of the mill and the bottom of the canyon was limited, and that it was not practicable, for these preliminary experiments, to put the mill elsewhere. We found it impossible to install intervening V tanks, settling boxes, classifiers, etc., as would certainly be necessary to secure the best results. It seems fairly evident from the results of these experiments that a large mill should yield above 75% extraction. This being the case the cost to the Nevada Consolidated Copper Co. of its copper, taking into consideration the steam-shovel work at Copper Flat, and the caving at Ruth, should not exceed 7½ or 8c. per pound sold in New York. Assuming a recovery of 30 lb. per ton, we would have on a 15c. copper market, 7c. per pound profit, or $2.10 per ton of ore. Assuming 15,000,000 tons of actual ore blocked out in the property, this would give a net earning capacity of something over $30,000,000, or figured upon the present outstanding stock, plus the 200,000 shares reserved for conversion of railway bonds, and 300,000 reserved for conversion of mining bonds, or a total of 1,600,000 shares, a net dividend of approximately $20 per share from ore now developed. In addition to ore now developed, or actually blocked out by drifts, cross-cuts, and raises, bore-holes have demonstrated the existence of a probable tonnage which, when blocked out, promises to greatly exceed the tonnage already developed.

In addition to this the Company has an acreage unprospected far in excess of the area known to contain ore, all within the porphyry area, and all possibly ore-bearing. The developed ore lies entirely in the Ruth, Fraction Tunnel Site, Blair, Eureka, Star of the West, and Star claims. The total holdings of the Company comprise 63 claims, giving it the heart of the district and an ore-bearing area in excess of the combined area of all the other companies operating on the mineralized belt. It would be foolish to attempt to forecast the ultimate tonnage that may be developed.

While this article has been in preparation, the concentrating and smelting plant has gone into commission, and preliminary results seem to confirm the work of the experimental mill in every respect. The roasters are doing more than expected of them, and the reverberatory furnace is approximating the best Anaconda practice.

CONCRETE BOATS AND BARGES.

*An interesting little item has appeared in the newspapers and technical journals from time to time concerning a concrete boat made in France some years ago. Barges and pontoons of cement were also constructed on the Tiber by Messrs. Gabellini, of Rome. It is stated that concrete in this application as in building construction, has many advantages. The method of construction is simple and the boats are quickly made, at less cost than those of wood or steel. They will stand very rough usage, are practically indestructible, and, of course, are fireproof. It is also said that the smooth surface of the cement-finish offers less resistance than wood, and that the bottoms do not foul easily or collect seaweed. Consequently they are easy to clean. In case of damage to any portion of the boat repairs are quickly and cheaply made with cement or concrete. A comparison of cost with steel barges has shown that the concrete boat can be constructed at half the cost and that in the matter of maintenance the cost is about a fourth or a third less.

As examples of the boats constructed the 'floating chalet' for the Rome Rowing Club was built in 1897 on pontoons, and has a length of 67 ft. with a beam of 21 ft. The posts and roof are of concrete, re-inforced with expanded metal. The *Liguria* is a barge of 150 tons, and was constructed by Messrs. Gabellini in 1905. Since January, 1906, she has been working in the harbor of Civita Vecchia, near Rome. In October, 1905, she was towed from Rome down the Tiber to the sea. She was also towed to Genoa and Savona, after which she was towed back again to Genoa and Civita Vecchia. A 100-ton barge was constructed on order of the Italian Government in 1906. She was tested in the military harbor of Spezia, and was so successful that a contract was placed for four more on the same lines. These particular barges have a double sheet, forming watertight compartments, and are practically unsinkable. Their dimensions are 51 ft. long by 16 ft. beam. Smaller pontoons have been built in large numbers. In America concrete boat-building is an entirely undeveloped enterprise, but that it offers great possibilities would seem to be indicated by the success attained in Italy.

Metallic vapors begin to condense at temperatures depending upon the vapor-tension curve of the metal and the amount of other uncondensible gas with which it is mixed. These intermixed gases reduce the pressure upon the metallic vapor, and lower the temperature at which the vapor becomes saturated. The phenomenon is exactly analogous to the 'dew point' of air and the precipitation of rain.

* Abstracted from *Cement Age*, June, 1908.

GOLD MINING IN PORTO RICO.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM B. MCKINLAY.

The search for gold has, for centuries, been one of the keenest quests of mankind. The pages of history are indelibly marked with witness to this truth; moreover, they are marked in letters of scarlet, for the gaining of the yellow metal has almost everywhere been accompanied by the shedding of human blood. The most striking period in history, as regards the search for gold, may well be stated to have been the time of the discovery and conquest of America. Volumes have been written on this subject, many of which have been quite as interesting to the casual reader as to the student and scientists who have scanned the pages in the hope of seeing old facts brought forth in a new light. How many have thus been spurred on to join the Argonauts in the never-ending search for the Golden Fleece? And yet again, how many lambs have been shorn of their own precious fleece by perusing the fascinating literature of some of our modern promoters, in which a few facts are so skillfully built up that the whole structure has the semblance of truth?

A noteworthy example of a fallacy constructed on some substantial facts, although in this instance without evil intent, is the oft-repeated story that gold was first discovered in California in 1848 by a workman digging in a mill-race in the Sacramento valley. This has been so thoroughly drummed into the minds of the school-children of the United States that it would seem almost sacrilege to dispel the illusion. Yet it is an indisputable fact, vouched for by the records of the San Fernando Mission, that gold was discovered and mined in what is now California as early as 1842, and probably fifteen years earlier. A book entitled 'Life in California,' published in 1846 by Wiley & Putnam, of New York, gives a very clear account, on page 190, of placer mining near the San Fernando Mission, and of what was at that time considered to be the first mine which was discovered in California. If such a misconception of comparatively recent events can be so generally entertained, is it surprising that many salient facts concerning the history of the first discovery and mining of gold by Columbus and his followers should remain comparatively obscure and almost entirely overshadowed by later events?

The first gold seen in America by the conquerors was worn by the natives of Watling's island, or Guanahani, where Columbus first landed, on Friday, October 12, 1492. Here, and in the neighboring islets, were seen gold ornaments which several of the inhabitants wore suspended from the nostrils. In at least one instance the nose ornaments bore certain marks resembling letters, which led Columbus to believe that it was used as money; but subsequent investigations convinced the Spaniards that money, in the European conception, did not exist among these aborigines. Such conversation as could be carried on by means of signs led the discoverers to understand that to the south lived a great king, in whose dominion existed an abundance of the metal which excited the curiosity of the newcomers. So, as hounds follow the scent, they turned their vessels toward what they believed to be Cipango (Japan) and discovered the island known to the natives as Cuba. They were well received here, and sent a small company into the interior, to the residence of a chief or Cacique, where they saw many gold ornaments of various kinds. The chase was not at an end, however, for the Cubans of that age pointed to the east and said bohìo when asked about the gold. They meant the island which was known to them as Ayti, where there were many houses; the word bohío, in their language, signifying a house. The Spaniards also understood the natives to say Cubanacán, and for a time they thought it referred to Kublai Khan, the ruler of the Mongolian races in Asia; but it was finally interpreted to mean the interior of Cuba. Consequently they spent some time in Cuba, landing at different points, but eventually continued eastward.

Martin Alonso Pinçon, commanding the Pinta, became impatient and left the others on November 21, but was afterward overtaken. At one port where a stop was made Columbus saw some stones which apparently contained a little gold, but it seems that he did not consider them as important as gold unaccompanied by rock. He called the bay Santa Catalina, and the locality is in what is known today as the Province of Holguin, north of Santiago de Cuba.

The Santa Maria and the Niña proceeded eastward, hoping to rejoin the Pinta. On December 6 they made a brief stop at the northwestern extremity of Ayti, which island they named Española. They skirted around the north coast and entered a bay opposite a small island, which they called Tortugas on account of the tortoises seen in that vicinity. The natives fled, but the Spaniards managed to capture a woman who wore the now familiar golden nose-ornament. As the Spaniards treated her kindly, she spoke highly of them to her people, who then gave the newcomers a hearty welcome. Here again the natives pointed to the east when asked where gold was obtained. About two weeks were spent at this place, cultivating the natives in a social way, bartering trinkets for gold, and refitting the vessels for a continuance of the voyage. Another stop was made a few leagues away, where a native king, Guacanagari, entertained them royally. One calm night, while even the helsmman slept, the Santa Maria drifted ashore and was wrecked. Guacanagari rendered every aid possible, and saved practically everything of value. As the Niña could not conveniently accommodate the crews of both vessels, it was decided to establish a colony among the natives. The timbers of the ill-fated Santa Maria were used to build a fortress, and 39 men volunteered to remain, under the leadership of Diego de Arana. This first colony known to have been established by Europeans in America was left to shift for itself on January 4, 1493, on the north coast of what is now the republic of Hayti. It was called La Navidad, as the Spaniards arrived there on Christmas day.

Sailing toward the east, the Niña fell in with the Pinta on second day. Pinçon gave an account of his

adventures and of the gold he had obtained by bartering with the natives; and although Columbus always maintained a bitter resentment, Pinçon was nominally forgiven for his desertion. The two vessels touched the coast at different points, and at the last port the first bloody conflict took place, several natives being killed before the rest were 'pacified.' After securing more gold by barter, and such provisions as could be obtained, the Niña and the Pinta set sail for home, carrying Indians from different islands they had visited. When they had sailed about sixteen leagues from Española the Indians pointed out the island of Boriquen, which some of them called Carib, and told of the gold which might be found there, but Columbus respected the wishes of the majority and continued on toward Spain.

On his second voyage Columbus landed on the island of Boriquen and gave it the name of San Juan Bautista, or, as we would say in English, St. John the Baptist. This name became shortened later to San Juan; and still later the island and its capital city, Puerto Rico, gradually changed names with each other. Although Columbus knew, from the accounts of the Indians, that the island must be rich in gold, he hurried on to Española to render assistance to Diego de Arana and his little band of colonists.

The early history of Boriquen is to a great extent intermingled with that of Española. The island of Boriquen was somewhat neglected for several years, although not entirely so. Many of the vessels which passed between Española and Spain stopped for water at or near the port which in later years became known as Aguadilla, that is, the little watering-place. While on a voyage of exploration, in September, 1493, Columbus landed on Mona island, which has come to be considered as a part of Porto Rico. The voyagers found on the island some very fine large melons; and this was by no means the last instance in which the directors of an American mining enterprise cut a few melons before actual mining work began.

In 1499 Alonso de Ojeda started from Seville on a voyage of discovery, among his party being Amerigo Vespucci. According to Herrera's 'Historia de las Indias Occidentales,' they stopped at the island of San Juan on the way home and carried 222 of the inhabitants to Seville, but it does not appear that Ojeda tried his luck at mining on the island. During the years immediately following the early settlement of Española, it is probable that many individuals desired to settle on the adjacent island of San Juan, with the hope of enriching themselves by working the gold placers talked of by the Indians. On April 24, 1505, a contract was made with Vicente Yañez Pinçon, in consideration of the services he had rendered in the conquest of Española and in explorations and discoveries, giving him the right to colonize the island of San Juan, under certain conditions, and appointing him captain and chief magistrate of the island. Pinçon took Martin Garcia de Salazar into partnership with him, and they started a cattle ranch, and made a half-hearted attempt at developing the island, but do not seem to have done any active mining. Pinçon evidently preferred the exploring business, for he continued at sea, and in 1507 was appointed a 'royal pilot'. As it was but a short distance from the east coast of Española to the island of Boriquen, the natives passed from one to the other in canoes at frequent intervals. In 1508, Captain Juan Ponce de León, residing in Higuey, the most easterly province of Española, heard from some of his Indian servants that there was much gold on the island Boriquen. Ponce de León had come from Spain with Columbus on his second voyage, and had acquired no little wealth and influence in Española, particularly on account of his military service, having been appointed lieutenant-governor. When Ponce heard of the abundance of gold in the neighboring island, he quietly obtained permission from the governor, Nicolás de Ovando, to investigate, and to see what the possibilities were for colonizing the island. Ponce was a very diplomatic financier, and gave the natives what might, in modern slang, be called 'the glad hand,' and it is reasonable to suppose that he opened wine. At any rate, Guaybana, the cacique, showed him some of the gold mines of the island. It was not a prospecting trip, in the modern sense. Guaybana had a controlling interest in several excellent placer-propositions, and expected to sell his rights for the good will of the Spaniards, evidently supposing that the good will would be perpetual, and that he was doing a service to his country in making such a bargain; but the Spaniards failed to fulfill their part of the implied contract. Guaybana showed Ponce several rivers where gold was found, and especially two that were very rich. Ponce took samples to show to Ovando. Several Spaniards were left on the island, to keep Guaybana and his people in good humor, and perhaps to prevent other parties of Spanish explorers from trying to drive a bargain with the natives. Of the rivers, only the Cebuco seems to be positively identified. It is on the north coast of the island, and gold placers have been worked there in recent years, near the town of Corozál. As to the other, called the Manatuabón, some writers have insisted that it was also on the north coast, but the majority have described it as being on the south side of the island, and as flowing into the sea near Cape Mala Pascua. The Maunabo river fits this description, and the names are similar. Fray Iñigo Abbad, who wrote in the eighteenth century, says that Agusybana showed Ponce the rivers from which they obtained gold, especially the Manabón, which debouches on the south coast, adjacent to the cape of Mala Pascua; and the Sibuco, which empties on the north, to the west of the capital city.

Ponce de León arrived in Española with his samples of gold, which, after melting, showed a value of less than 450 maravedis to the peso. While not quite as pure as that which had been found in Española, it was considered very good; especially as there appeared to be a great quantity available in the island of San Juan. The maravedi is difficult to define. There have been maravedis of gold, of silver, and of copper; and the value of the silver and copper maravedis fluctuated between wide limits.

However, about the time of Ferdinand and Isabella, 490 maravedis was the value of a gold peso or castellano, presumably 900 fine.

The peso or castellano was a unit of weight and was equivalent to 4.6 grams; so that, in terms of our money, a peso of pure gold was worth $3.04. The gold shipped from America to Spain was never pure, and the fineness probably varied between 700 and 900, and in estimating the modern value of the pesos of gold that were shipped, limiting values of $2.13 and $2.74 should be taken. Assuming the fineness of the gold to have averaged about 855, $2.60 may be assumed as the average value per peso of the gold shipped from the West Indies.

Although conditions on the island of San Juan appeared favorable to Ponce de León, he was destined to have his troubles. Diego Colón, the son of the discoverer, and chief admiral, was hostile to Ponce and to Nicolás de Ovando, and deposed the latter from the governorship of Española. Ponce returned to his new island, taking his wife and daughters with him, and proceeded to govern the island by right of occupation. The news of Ponce's exploration having reached Spain, permission was given to Don Cristóbal de Sotomayor to go to the island of San Juan and to take as many settlers as he pleased. At the same time Lope de Conchillos was appointed melter and marker of gold for the island. Diego Colón refused to recognize the credentials of Sotomayor, who arrived from Spain with an appointment from the King as governor of San Juan. Diego appointed Juan Ceron and Miguel Diaz as his representatives to govern the island, where many colonists had now settled. Ceron and Diaz managed to hold their respective offices of judge and sheriff for nearly a year. Meanwhile Nicolás de Ovando had appealed to the King in behalf of Ponce. The King had written to Ovando on May 3, 1509, urging that Ponce keep up his good work in developing the island. On August 14, 1509, the King sent him an official appointment as provisional governor, with the assurance that the Admiral would not have the power of removal. Notwithstanding the political wrangling, the new settlers commenced mining in earnest, and the natives were pressed into service.

The Spaniards devised no mechanical contrivances to extract the gold, but organized the work in such a way as to get a large yield by the methods already in use. Each Spanish miner acted as a foreman and divided his native force into three gangs. One gang loosened and excavated the gravel, and another gang carried it to the third, known as the washers.

The instrument used was the batea or gabata, a bowl hollowed out from a single block of wood, in shape similar to a common bread bowl, but more elliptical, and with projections at the ends by which to grasp it.

For several years the Spaniards contented themselves with working the deposits in the beds of the rivers, which they diverted temporarily from the usual courses. They also worked the gravel deposits near the rivers. They would stake out claims in squares or rectangles, excavating the ground in successive layers, testing each layer of 6 in., and discarding or washing the entire layer according to the results of the tests. Excavation continued to bedrock, or until it became necessary to abandon it because of the caving of the ground or the excessive quantity of water encountered. They never thoroughly exhausted the ground, and it may be said that the island is as virgin today as it was before the arrival of the Spaniards.

(To be Continued.)

RARE-EARTH MINERALS IN TEXAS.

In the middle of the Llano region, which is an 'island' of pre-Cambrian rocks in almost the geographical centre of Texas, stands one of the most remarkable natural mounds in the United States. This mound is known as Barringer hill, and is celebrated for its content of what geologists term 'rare-earth metal minerals.' In a short description of this hill, which is formed by a dike and is only about 40 ft. high and 100 by about 200 ft. in lateral extent, F. L. Hess, of the U. S. Geological Survey, in Bulletin 340, just published, gives a list of about two dozen minerals found in this small area, among them a number of radio-active minerals. Among the rare-earth minerals found at Baringer hill are fergusonite, gadolinite, polycrase, yttrialite, and cyrtolite. The economic interest in these minerals is due to the incandescence of their oxides on being heated. This property makes them available for use as glowers in gas and electric lamps. Thoria, beryllia, yttria, and zirconia are the most useful minerals employed for this purpose. Until the discovery of the deposit at Baringer hill it was practically impossible to get sufficient yttria-bearing minerals to manufacture mantles for electric glow-lamps; but fergusonite and gadolinite, with lesser amounts of cyrtolite, and other minerals containing yttria, occur here in quantities large enough to meet the demand. The Nernst Lamp Co. owns this valuable deposit, but its needs require only the occasional working of the mine. After enough yttria minerals are obtained to supply its wants for several months, the mine is closed. Only a few hundred pounds per year are extracted.

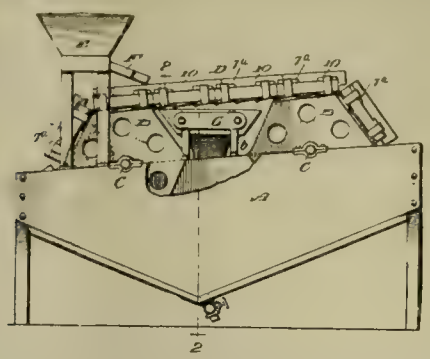
The geologic island in which Baringer hill is situated is interspersed with other mounds and dikes of similar appearance, which have been considerably prospected, without much success. Mr. Hess states that as these rare-earth minerals constitute only a small fraction of one per cent of the total mass, commercially large amounts may exist in a dike and not be exposed at the outcrop. He suggests that cracks which generally surround the nuclei of the minerals may be utilized in prospecting. In mining the ore of the larger pockets of Baringer hill the hands and faces of the miners have been affected as if by sunburn, due probably to the radio-activity of the minerals.

The Italian State Railways have recently placed orders with various Italian firms for 300,000 reenforced concrete ties, at a price equivalent to $1.50 per tie.

MINING AND METALLURGICAL PATENTS.

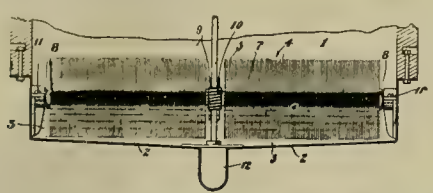
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ORE-SCRENN.—No. 889,673. Frank Franz, Burke, Idaho.



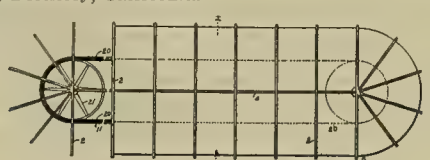
The improved endless screen apron comprising a series of sections formed of screens proper and rectangular wooden frames upon which such screens are secured, and cross-bars and parallel chains which said bars connect, the chains being formed of flat links to which the screen-frames are attached, the ends of the frames abutting as shown and described.

GOLD-SAVING APPARATUS.—No. 889,813. Louis Sachse, Los Angeles, California.



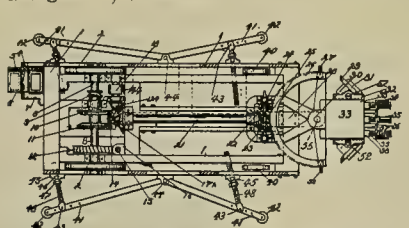
An amalgamating box provided with a detachable mercury container roller bearings entirely inside said container, a shaft mounted in said bearings, disks on said shaft spaced apart by washers and a nut screwed on said shaft and clamping said disks and washers.

ORE-ROASTING FURNACE.—No 891,300. William H. Smyth, Berkeley, California.



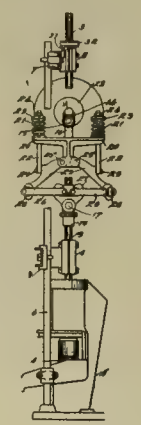
An ore roasting furnace having a hearth formed in two substantially parallel stretches the adjacent edges of which are structurally unseparated, a slot in each of the stretches intermediate of the sides thereof the slot being joined by a curved slot continuation, rabbling devices in the furnace and means projecting through the slots to effect their travel.

TUNNEL-DRIVING MACHINE.—No. 891,473. George A. Fowler, Georgetown, Colorado.

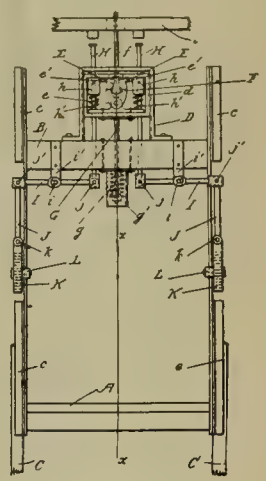


In a tunnel-driving machine, a car, a block pivotally mounted upon the car so as to swing horizontally in front thereof, thrusting drills carried by the block, and means mounted on the car and on the block for automatically oscillating the drill-block, the said means adapted for alternate contact—the means on the block with the means on the car at each oscillation of the block, means for operating the drills, and means for causing the car to advance in the cutting operation.

STAMP-MILL.—No. 891,497. Francis I. Matthews, Oakland, California.



No. 891,497



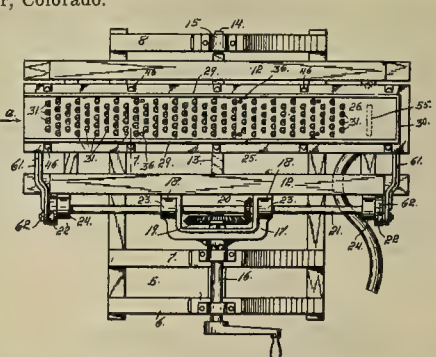
No. 889,408

In a stamp mill, the combination of a stamp stem, a sleeve within which the stem is turnable, said sleeve having a projecting wrist-pin, means on the stamp stem for retaining the sleeve in a fixed position relative to the stem, a crank and a connecting rod or pitman through which motion is transmitted to reciprocate the stamp stem, hinged arms connected with the pitman, a table carried by said pitman, springs mounted upon the table, tension rods connecting the springs with the hinged arms, and means connecting the outer ends of the hinged arms with the wrist-pin.

SAFETY DEVICE FOR MINE-CAGES.—No. 889,408. Charles Shewan, Plymouth, Pennsylvania.

The combination, with a mine cage, and its guides; of a frame, slidable stops carried by the said frame and norrope, a pair of jaws pivoted at their lower ends to the said frame, slidable stops carried by the said frame and normally holding the upper end portions of the said jaws in engagement with the said lifting-rope, safety-clutch mechanism for engaging with the said cage guides operatively connected with the said stops, and means for sliding the said frame and applying the said clutch mechanism automatically when the cage is detached from the lifting-rope.

DRY CONCENTRATOR.—No. 891,409. Homer P. Curtis, Denver, Colorado.



A dry concentrating chute or sluice whose bottom is provided with a series of pockets whose rear portions are open at the bottom to permit the introduction of an air blast from below, the rear portions of the pockets being also open to permit the escape of the air, substantially as described.

Analysis of Underground Work, Golden Horseshoe, Kalgoorlie.

The Chamber of Mines of Western Australia publishes in its *Monthly Journal* an interesting tabular statement of the mining operations at the Golden Horseshoe Estates Co., Ltd., one of the greatest of the Kalgoorlie mines, adjoining the properties of the Ivanhoe and the Great Boulder Proprietary. The Company leases 109 acres of mining ground titles to mining claims not being granted in Australia. The reduction plant consists of a 150-stamp mill with cyanide annex. The authorized capital is £1,500,000, all issued. The figures given are for the year ended December 31, 1907.

MEN EMPLOYED.—The average number of men employed per day in the underground workings of the mine is 492, distributed as follows:

Stoping ore	262
On development work	68
Repairers	13
'Mullockers' (ore sorting)	66
Truckers (trammers)	15
Brace and platmen	14
Timbermen	13
Engine and winch drivers	9
Shift and trucker bosses	11
Sundry	21
Total	492

SHIFTS WORKED.—The total number of individual shifts worked, namely, 152,111, is equal to 309 working days of three shifts per day during the year.

WORK DONE BY 3⅝-IN. ROCK DRILL MACHINES.—The total average number of machines in constant use throughout the mine equals 28.1. The following are particulars of the work done in stopes and on development:

STOPING.

Machines in use per shift	23.1
Number of holes bored	68,257
Average depth per hole bored	6.92 ft.
Total distance bored	89.4 miles
Average number of feet bored per drill per shift	22.2
Tonnage of ore broken	10.9 tons

DEVELOPMENT.

Machines in use per shift	5.0
Drifts	3,566½ ft.
Cross-cuts	836½ ft.
Passes, raises, and winzes	1,942 ft.
Shaft sinking	117½ ft.
Total footage developed	6,462½ ft.

EXPLOSIVES USED.—The following are the quantities used during the year:

	Lb.		Tons.
Blasting powder	54	=	0.024
Gelignite, 1⅛ in.	170,070	=	75.924
Gelatine dynamite, 1⅛ in.	2,100	=	0.938
Blasting gelatine, ⅞ in.	8,815	=	3.935
Blasting gelatine, 1⅛ in.	64,025	=	28.583
Total	254,064	=	109.404
Detonators	132,175		
Coils of fuse	30,009		

	Lb.
Stoping (explosives used per ton of ore broken)	0.73
Drifts (explosives used per foot driven)	14.53
Cross-cuts (explosives used per foot driven)	9.36
Passes, raises, and winzes (explosives used per foot risen or sunk)	7.27
Shaft sinking (explosives used per foot sunk)	14.89

CANDLES.—The quantity of candles used amounted to 68,601 lb. or 30.63 tons.

TOOLS SHARPENED.—During the period under review the following number of drills were sharpened, and picks pointed:

Hand drills	79,234
Machine drills	257,028
Total	336,262
Picks pointed	887

TIMBER.—During the year 778,429½ superficial feet of timber has been used for various purposes underground, comprising the following quantities:

	Feet.
Sawn timber	92,758
Round timber	612,559
Split slabs	41,597½
Oregon	31,515
Total	778,429½

WORK DONE HOISTING AT THE SHAFTS.—The following particulars represent the hoisting done by the various cages at the No. 1 and 2 shafts (exclusive of 'mullock' (waste) handled between levels):

Particulars.	Trucks of Ore.	Cages of Timber.	Cages of Men.	Trucks of Tools.	Totals.
Main shaft (double compartment, with double-decked cages)	193,330	945	32,213	2,248	228,745
Main shaft (single compartment, single cage)	69,627	1,726	.....	18,997	90,350
No. 2 shaft (double compartment, single cages, working one shift only)	66,488	606	1,266	128	68,488
Totals	329,445	3,286	33,479	21,373	387,583

ORE BROKEN AND RAISED.—247,084 tons of ore have been broken and raised during the year:

	Tons.
From stopes	230,983
From development	16,101
Total	247,084

Average tonnage per man per shift (based on the total number of men engaged in the underground departments, namely, 492) = 1.624 tons.

Average tonnage per man per shift (based on the total number of miners actually engaged stoping = 262 men for 309 days, breaking 230,983 tons) = 2.853 tons.

Publications Received.

STRENGTH OF CONCRETE BEAMS, by Richard L. Humphrey. Bulletin No. 344, U. S. Geological Survey.

CONTROLLING FACTORS OF ARTESIAN FLOWS, by Myron L. Fuller. Bulletin No. 319 of the U. S. Geological Survey.

THE FAIRBANKS AND RAMPART QUADRANGLES of the Yukon-Tanana Region, Alaska, by L. M. Prindle. Including a chapter on the Rampart placers, and a paper on the 'Water Supply of the Fairbanks Region.' Bulletin No. 337 of the U. S. Geological Survey.

THE CITY OF ANACONDA, an illustrated pamphlet of 40 pages commemorative of the twenty-fifth anniversary of the founding of the city. The booklet contains a history of the camp and a description of its present enterprises and industries.

HANDBOOK OF NEVADA MINING COMPANIES. Compiled by the Todd Information Bureau. Paper, pp. 102. Goldfield News, Goldfield, Nevada. Price $1. For sale by MINING AND SCIENTIFIC PRESS. The corporate name, capitalization, officers, directors, address, names of claims owned, work done, production, and dividends paid of all the mining companies doing business in Nevada, are fully set forth in this little compendium.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

LOCATION NOTICE—CONSTRUCTION.

The object of a location notice is to give notice to subsequent locators; and if a location notice is defective, a subsequent locator will be bound where he has actual notice of the prior location, at least so far as such defects are concerned. It is the policy of the law that location notices should receive a liberal construction, to the end of upholding locations made in good faith.

Bismark Mt. Gold Mining Co. *v.* North Sunbeam Gold Co., (Idaho) 95 Pac. 14., March, '08.

RECORDING LOCATION NOTICE—EFFECT.

The location notice, when recorded, is prima facie evidence of all the facts it is required by the statute to contain, and which are sufficiently set forth therein; and with the affidavit of the locator attached, setting forth the fact that the ground was unoccupied mineral land of the United States at the time of his location, when introduced in evidence in an adverse suit, makes a prima facie case. The notices are prima facie evidence of all the facts required by the statute to be stated, which are, in fact, sufficiently stated in the notice. A mistake in the notice may be corrected by oral evidence. The fact as to whether the work was done, is the principal question, and not its method of proof.

Bismark Mt. Gold Mining Co. *v.* North Sunbeam Gold Co., (Idaho) 95 Pac. 14., March, '08.

QUIETING TITLE TO MINING CLAIM.

In an action to quiet title to a mining claim in support of an adverse proceeding pending in a land office, a complaint was held sufficient which alleged that the defendant, a prior locator, did not have a valid location; that his claim was never marked nor monumented on the ground so that a boundary could be distinctly traced; that the surface boundaries of the claim were never marked by any substantial posts projecting four feet above the surface, nor were such boundaries marked by substantial stone monuments three feet high. And as against the objection that the complaint showed a forcible and clandestine entry, it was sufficient where it averred that the plaintiff in a peaceable and lawful manner explored said premises and discovered and found placer gold.

Phillips *v.* Smith, (Ariz.) 95 Pac. 91, March, '08.

MINING CLAIM—RIGHT TO ACQUIRE TITLE BECAUSE OF VARIANCE.

Certain persons contracted to purchase mining claims which had been surveyed and monuments erected, and for which patents had been issued; but a variance was discovered between the ground conveyed by the patents and the ground intended to be denounced. The purchasers were not estopped, because of the contract of purchase, from denouncing claims covering the territory intended to be included by the vendors in their claims, and from acquiring title to the property adversely to the vendors.

Butterfield *v.* Nogales Copper Co., (Ariz.) 95 Pac. 182, March, '08.

WORKING MINES—INJURY TO SURFACE.

Where the evidence failed to show that the owner of the minerals in working the mines under a reserved right caused or contributed to the injury of the surface, it was said to be immaterial whether the owner of the surface was entitled as an absolute right to subjacent and lateral support to the surface, or whether, having purchased subject to the reservation in favor of the owner of the mineral rights, he had no right to complain of any injury or disturbance, except such as resulted from the want of ordinary care in the conduct of mining operation necessary to prospect for and extract ore.

Knipe *v.* Anaconda Copper Mining Co., (Mont.) 95 Pac. 129, April, '08.

Supplying Power for Use in Building the Los Angeles Aqueduct.

Probably no greater feat of hydraulic engineering has been attempted in this country than the project for securing for the city of Los Angeles, California, a water supply from the snow-fed Owens river and its tributaries by means of a 215-mile aqueduct which will bring 400 cu. ft. of pure snow water per second into the city. In building a work of such magnitude it necessarily followed that the question of adequate cheap power to use in excavating, tunneling, and the like assumed prime importance. The large cost of power generated by steam at all points on the line necessitated the adoption of electricity as the motive power. Current is to be furnished eventually from hydro-electric plants built along the line of the aqueduct. The chief source of electrical energy at first will be from the mains of the Edison Company, whose high voltage transmission lines extend to the city of Los Angeles from the Kern River Hydro Electric Plant. In many respects the Kern river power-development is unique. It is claimed to be the largest hydro-electric plant west of Niagara. The transmission line of 117 miles is one of the longest in the world. The pressure of 75,000 volts over such a length of cable is one of the highest ever attempted. The conduit which leads to the pressure-main is the longest underground tunnel system now in use for such a purpose. The concrete-encased penstock, from which the supply will come, tapering so as to accelerate the force of the water at the power house, is said to be the first of its kind ever placed in service. The four big wheels were built by Allis-Chalmers Company, of Milwaukee, and have each a capacity of 10,750 hp. at full nozzle-opening, and a speed of 250 r. p. m., when operating under a net effective head of 865 ft. In addition to the main turbines there are two exciter-turbines, also of Allis-Chalmer design, each with a capacity of 450 hp. and a speed of 430 r. p. m. The turbine units are of the impulse type, with hand-adjustable needles and governor-operated deflecting nozzles. Each unit has two runners, one on either end of the generator shaft. The interchangeable buckets are made of non-corrosive phosphor-bronze and are attached to the cast-steel discs bolted to the flanged ends of the generator shaft. The nozzles are provided with hand-adjustable needle and arranged to be deflected by the governor automatically, or by a hand-regulating device. By deflecting the jet, instead of regulating its discharge by adjusting the needle with the governor, it is possible to secure a constant velocity of water in the pipe-line, as well as a constant discharge of water into the tail-race, even when the plant is operating with heavy fluctuations of load. The Kern river installation of the Edison Company is but one of three water-power developments owned by this concern, in addition to six or seven steam plants situated within a radius of 200 miles, all of which will operate in synchronism. A portion of the output of this plant is disposed of along the line to Los Angeles. A considerable amount of the power will also be utilized in the city of Santa Barbara. The demand for power in Los Angeles, Santa Barbara, and San Luis Obispo counties far exceeds the supply, and the output from this station helps to satisfy the general requirements rather than being devoted to any specific purpose. The Edison Company contemplates the building of plants No. 2, 3, and 4 on the Kern river, which will aggregate over 100,000 hp. in addition to the output of the present station.

Engineering Societies.

The Canadian Mining Institute has published a provisional program for the excursion at the time of the visit of the British and European delegates. The party will start from Quebec on August 24 and stop at Sydney, Stellarton, Sherbrooke, Montreal, Toronto, Niagara Falls, Cobalt, Frank, Blairmont, Ferine, Rossland, Trail, Nelson, Grand Forks, Greenwood, Victoria, Vancouver, and Banff, returning to Quebec on October 1.

Prizes for Photographs of Wire-Rope Tramways.

The Trenton Iron Co., with a keen sense of the stimulating effect of competition, has turned this to good account as a means for extending the influence of the firm and for enlisting the best kind of coöperation in advertizing, through an offer of substantial rewards for photographs of plant in operation which this concern had designed and erected. The prizes to be won are as follows:

$25.00 For most striking picture of a wire-rope tramway of the Bleichert system showing carriers in transit; or best picture showing carriers in transit on a long span across a river or ravine; or best picture of self-dumping bucket in act of discharging; or best picture of cable hoist conveyor or cableway equipped with patent locked-wire track cable. Above to be from negative not less than 8" x 10".

$20.00 For ditto from negative not less than 6½" x 8½".

$15.00 For ditto from negative not less than 4" x 5".

$20.00 For next best picture as above from negative not less than 8" x 10".

$15.00 For next best ditto from negative not less than 6½" x 8½".

$10.00 For next best ditto from negative not less than 4" x 5".

$25.00 For best picture of loading terminal showing carrier in act of being attached to traction rope; or best picture showing carrier with overhead grip attached to traction rope in act of passing around sheave at angle or terminal station; or best picture of station showing bucket in act of being transferred to surface car; or best picture of line crossing a public road of any kind, showing guard net. Above to be from negative not less than 8" x 10".

$20.00 For ditto from negative not less than 6½" x 8½".

$15.00 For ditto from negative not less than 4" x 5".

$20.00 For next best picture as above from negative not less than 8" x 10".

$15.00 For ditto from negative not less than 6½" x 8½".

$10.00 For ditto from negative not less than 4" x 5".

10 prizes of $5.00 each will be awarded for pictures that call for honorable mention, such negatives to become the property of The Trenton Iron Company.

Photographs must show clearly the above-mentioned features of the tramway installation, and be suitable for reproduction in half-tone plates; otherwise they will not be considered. Pictures or negatives not receiving awards will be returned if postage accompanies them. No picture will be considered that has been used heretofore in any way by The Trenton Iron Co. Only one award will be made in each case for best and one for second best, the amount of the award being in accordance with the size of the negative as stated. The merits of the different pictures will be decided by ballot of a committee of five persons to be appointed by the president of The Trenton Iron Co., who will be one of the five and chairman of the committee. Negatives of the photographs winning prizes will become the property of The Trenton Iron Co., and the prizes will be paid upon receipt of these negatives in good condition. Awards will be made October 15, 1908, and photographs or pictures must be entered on or before that date. All photographs or pictures presented for competition, and correspondence, should be addressed to The Trenton Iron Company, Trenton, N. J., and marked 'For Prize Competition.'

Catalogues Received.

The Sullivan Machinery Co., Chicago, has issued Bulletin No. 60B, describing its line of hammer-drills.

The Bristol Co., Waterbury, Conn., has issued bulletin No. 92, describing its line of recording thermometers.

The Jackson Drill & Mfg. Co., New York, has issued bulletin No. 18, describing its line of hand-power rock drills.

The Consolidated Tramway Co., Roanoke, Virginia, has issued a pamphlet describing its system of aerial and motor tramways.

The Jeffry Mfg. Co., Columbus, Ohio, has issued catalogue 26, describing and illustrating its centrifugal fan as used for mine ventilation.

The C. O. Bartlett & Snow Co., Cleveland, Ohio, has issued catalogue No. 26, the subject being paint manufacturing machinery.

The Joshua Hendy Iron Works, San Francisco, has issued bulletin No. 113, descriptive of stamp-mills with triple and quadruple discharge mortars.

The Brown Hoisting Machinery Co., Cleveland, Ohio, has issued catalogue O, illustrating and describing its line of machinery used in the manufacture of gas and coke.

The Vulcan Iron Works, Wilkes-Barre, Pa., has issued a series of attractive sheets giving complete information relative to the different classes of locomotives manufactured by it.

Commercial Paragraphs.

Hampson & Fielding, Denver, have recently incorporated under the title of The Hampson & Fielding Engineering Company.

Ralph C. Nowland, formerly with S. W. Mudd, of Los Angeles, has opened an office as mining engineer at Salt Lake City.

C. F. Nourse, civil and mining engineer, who is at present in Russia, announces the removal of his office to 614 Crocker Bdg., San Francisco.

The Denver Engineering Works announces that it has opened a district office in the Phelps Dodge Bdg., El Paso, Texas. L. G. E. Bignell is in charge.

The Deister Concentrator Co., Fort Wayne, Indiana, has recently received an order for 70 No. 3 concentrating tables from Goldfield Con. Mines Company.

The G. T. Ingersoll Machinery Co., of Salt Lake, recently sold to the Boston Con. Copper Co. a Leyner two-stage air-compressor for that company's Bingham mines.

The A. Van Der Naillen School of Practical Engineering graduated this year 29 students in their mining, metallurgy, and assaying courses. The school has been in existence 44 years.

The Lima Locomotive & Machine Works has recently shipped two 55-ton Shay locomotives for use on the Mexican Milling & Transportation Co.'s railroad in the Guanajuato district, Mexico.

W. G. Nichols, formerly assistant superintendent of the Taylor Iron & Steel Co., is now superintendent of the manganese steel department of the American Brake Shoe & Foundry Co., Chicago.

The Cutler-Hammer Mfg. Co., of Milwaukee, announces that Otis Squires, 111 New Montgomery street, San Francisco, will represent it on the Pacific Coast. A large stock of Cutler-Hammer controllers will be carried in stock, insuring prompt deliveries.

George W. Myers, San Francisco representative of the Chrome Steel Works, Chrome, N. J., has recently returned from a trip to Alaska, the Boundary and Kootenay districts of British Columbia, and the Coeur d'Alene and reports that he secured a large number of orders.

The Nevada Eng. Works, Reno, has recently shipped a 6-hp. hoist to the Harris M. & M. Co., Jumbo; a 15-hp. hoist to the Mazuma Con. L. & M. Co., Seven Troughs; and a 50-ton Lodger gas smelter to the Searchlight Santa Barbara Mining Company.

L. S. Pierce, of Denver, recently shipped to the Western Mines Supply Co., Butte, Mont., to Karns, Holland & McCray, Nogales, Ariz., and to the Advance Mines, Aetna, Cal., each, one of his 17 by 24 in. silver plated machines; to the Beaver Creek M. & M. Co., Hailey, Idaho, one 22 by 24 in. machine; to C. J. Seymour Baker, Kensington, London, one 10 by 24 in. machine; and to Fairbanks, Morse & Co., at Spokane, Wash., one 27 by 24 in. machine.

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Editorial.

CONSOLIDATION OF LAVA, according to Scrope, as appears in citations by Hiram W. Hixon in a letter published in our last issue, is due primarily to escape of occluded gases. This conception originated before 1824, when Scrope published his 'Considerations on Volcanoes.' He merely refers to it for the sake of accentuating the claim that occlusion of gases in large quantities causes "liquidity of the mass." The revival of this old conception is useful. There has been too much stress laid upon cooling of lavas as a means of consolidation. In fact, contact-metamorphism from high temperature is not by any means as common as might be expected along dike-walls; neither has there been the shrinkage which would result from solidification through mere abstraction of heat. Many lavas have manifestly 'set,' after the manner of cement, through the sudden development throughout the mass of interlacing crystals, without reduction of volume, and the elimination of gases may facilitate such crystallization. Angelo Heilprin had recourse to this theory of the earlier geologists to explain the progressive solidification of lava when the great monolithic plug was driven like an obelisk out of the crater of Mont Pelé to a height of 800 feet. Incidentally the 'set' did not occur under pressure, and the heat was perhaps dissipated too rapidly to produce a coherent rock. Though it may be working a mere analogy rather hard, we might suggest that as cement needs to set under water to prevent weakness, so lava needs to set under pressure and without too rapid loss of heat to yield such rocks as we actually find filling dikes in the earth. It is evident that such quantities of gas must have evolved from consolidating magmas as to invalidate estimates based on gases in volcanic rocks accessible at the earth's surface.

LOCAL SECTIONS of the Mining and Metallurgical Society of America are provided for by rules recently approved and issued as Bulletin No. 2. For such local organizations an actual membership of five is required in a convenient area within which reside ten members of the Society. Papers read and discussed are subject to previous acceptance by the council, so that the local associations do not possess any independence or jurisdiction except as members of the central body. They become merely an extension of the field of activity of the Society, stimulating discussion through personal contact. The friction between minds is provocative of new and vigorous thought. This is such a trite statement as to seem almost superfluous, yet it is a remarkable fact that only a few of the technical and learned societies of America have been so deeply impressed with the truth and value of it as to include in their system of organization any provision for associating the

scattered members in nuclei where effective co-operation may be possible. An institution pretending to be national and representative without branches is very like a head without members. On the Martian principle, so lucidly but not alluringly expounded by Mr. H. G. Wells, the memberless head may direct a wonderful and efficient mechanism, but in effect the disproportion between the treasures of wisdom and knowledge which the engineering societies bring to light by their present methods compared to what might be called forth through the direction of a large number of vigorously working associations of members, is as great as that between the practical influence on the world's work of the Comtian philosophy and of the omnipresent Standard Oil Company. We do not bring these into juxtaposition because of any inherent relation between them, but as a striking example of widely differing degrees of success. An institution to advance the interests of a profession, however, must be so far Comtian, and to that extent imitative of the spirit reflected from the Standard Oil Company in all of its manifestations, as to recognize in man and the world the only two positive and knowable data. It is not for us to point out the different kinds of supreme authority deducible from the evidence in the very divergent examples chosen, but the system which makes men everywhere consciously and acceptably part of a great moving mechanism is both giving and receiving the vital principle of growth.

Bullion Accumulation in San Francisco.

SECRETARY CORTELYOU has had a new inspiration. This one has evidently come from a source whence shines a brighter and clearer light. About the kalends of June an order issued to suspend payment for bullion on the Pacific Coast in New York exchange. Uncle Sam's 'strong-box' in San Francisco contained $300,000,000 in coin, and it kept piling up. Nobody wanted much of the metal itself, so long as he could get paper representing it. That was good enough for the people. So the Secretary of the Treasury sought a remedy for the accumulation. But the remedy failed to work. In the first place, Seattle insisted on discrimination in her favor, claiming that the stream of yellow metal from Alaska would pass on to San Francisco if depositors were required to take out their coin. Influence was strong enough to relieve the United States Assay Office in Seattle from the order effective on June 10. Such favoritism was of course undemocratic, and whether it worked advantageously for Seattle or not, it manifestly was not molded after that pattern of fair-play and equal opportunity, for which the Administration has insistently striven to build up a reputation. As a matter of fact it did inure materially to the benefit of the Seattle banks, enabling them to control large amounts of New York exchange, which has for a considerable period commanded a high premium on this Coast. They could thus offer advantages to correspondents sufficient to attract an undue share of the bullion offered at Pacific tide-water, and it made them a controlling factor in the exchange market of San Francisco. The tendency of coin and bullion to accumulate in the sub-treasury at San Francisco was not lessened, and apart from the operation of the separate rule for Seattle, the order to pay in coin would not have produced such an effect. The specie would promptly have gone to the banks for deposit, and thence all that was not required for circulation and surplus reserve would necessarily have returned to the sub-treasury in exchange for certificates of deposit. If the vaults are over-crowded, or—may we be pardoned the indiscretion of whispering it!—if this gold and silver be deemed safer at a point more remote from Pacific waters, one way only is available to get it there, namely, to charter a special train, as in a former instance, and send it under guard across the continent. By reason of a quite superfluous order, further bungled by an unjust discrimination, much inconvenience and trouble have been caused. Some elementary lessons in exchange have also been accentuated, which ought to have been understood well enough in Washington to have prevented interference with the normal currents of business by the adoption of a regulation in June only to be forced to recall it hastily in July.

The Mine-Warrant for Initial Capital Expenditure.

THE article in our issue of last week by Mr. Mark L. Requa on the 'Experimental Mill of the Nevada Consolidated Copper Company' at Ely, Nevada, is a notable contribution to the subject of adequate preliminary study of an ore deposit before plunging into the expense of installing permanent plant. The course pursued was so logical and simple that it would not seem remarkable except for the fact that the simple and obviously logical procedure to ensure safety is exactly what most corporations usually neglect. A speculative feature is inseparable from a mining venture. For that matter, there is a large element of uncertainty in all industrial enterprise. Financial conditions and variations in the market for raw materials and finished products, introduce risk into every kind of human endeavor. The cost of a manufacturing plant is expected to be returned to the investor, with profits, out of earnings dependent upon favoring conditions of demand for years to come. The comfortable paper manufacturer in New England, for example, need not purchase a Western mine to endanger the security of his capital. There are embarrassing difficulties enough in the provision of pulp-wood, and rags, and esparto, at prices which will assure him a strategic position in the hotly contested fight for commercial success. Thoreau once said, "We sit as many risks as we run." To think of the manufacturer as shielded from danger, and of the miner as a soldier of fortune exposed to the peculiar perils of a wild frontier of the money-getting world, is to insist on rating the practice of fallacious methods as expressive of a necessity arising out of the nature of the industry itself. It is singular that sane men, long trained in the hard school of commerce and conservative finance, throw their accumulated business-experience to the winds the moment they engage in mining. The customary safeguards, which they would not fail to employ in estimating the chances for a cement works, or a cot-

ton mill, are set aside with that frank disregard of practical relationships, which springs naturally from belief in mysteries, from hope and reliance on the unknown. Men who by training and experience should stand for the introduction of plain every-day methods of business into mining, in the way exemplified by Mr. Requa, are too often found acting as priests of the mysteries of mining. The fact that nearly all mines are equipped before sufficient ore to redeem the capital is proved, and that in the course of events many of these do become continuous and profitable producers for a long period of years, leads to elaborate efforts at reckoning probabilities. If these were based on averages deduced from sufficient data, it would be logically sound to appraise them, as insurance companies may safely calculate the risk of a building being burned or of a man dying within a given period. But the data are not reliable. They include the successes, but leave the failures out of account. If an engineer sanctions the appraisal of the unseen extension of a mine in depth at 40 per cent or 25 per cent of the capital needed for purchase and equipment, he is making a purely arbitrary assumption. He may have the best of geological reasons for his opinion, and these are worth the fees capable engineers ask for them, but, nevertheless, they are opinions, and we all remember the clean-cut Platonic distinction between opinion and knowledge. In short, the engineer's opinion should be a valuable bonus to the man who proposes to put in his money and operate the mine, in addition to the accurate revelations and estimates which determine the reasonableness of the venture.

The current practice of paying a vendor practically the total value of the ore developed in a mine is false to the principles governing transactions in any other sphere of industry. The farmer does not ask $200 per acre for land because it will, when cleared and fenced and tilled, yield $20 per acre for the next ten years. The limestone quarry for a cement works does not command a price that will absorb the profits of the industry for years to come. Moreover, the quarry is not sold at the very modest price per acre which such deposits bring until it has been thoroughly drilled and sampled over an area sufficient to guarantee raw material for an output adequate to promise reimbursement of capital, with profit, in a healthy market at some minimum price. It is this plain practical common-sense method which Mr. Requa has applied to the great copper mine at Ely. The investment needed was estimated at $5,000,000. Therefore, development was carried on until 15,000,000 tons of ore had actually been blocked out and sampled, showing a net earning capacity of $30,000,000, based upon a cost for the refined metal at New York of eight cents per pound. The ore reserves had been developed by shafts, levels, and cross-cuts, in addition to which, elaborate confirmation of the continuity of the mineralization throughout the blocks of ore was obtained by churn-drilling, using a Keystone drill. The results obtained in this way checked the sampling in the mine workings with such remarkable closeness as not only to prove the reliability of the estimates based on a practically uniform copper content in the orebody, but incidentally established the utility of churn-drilling for sampling metalliferous ores in place, under normal conditions, where it is found the sludge produced will keep the crevices closed and prevent the fine drillings draining away from the hole. As if this were not enough, the mine was re-sampled level by level on a large scale, as explained by Mr. Requa, the samples being actually tested in the experimental concentrating mill erected for this purpose. On the 200-foot level the sample so milled represented 186 pounds of ore per lineal foot of workings; on the 300-foot level 225 pounds; and on the 500-foot level 564 pounds. A total of 375,847 tons of ore was milled and a saving of 75 per cent of the copper was demonstrated.

Chance of failure is eliminated by such thorough preliminary study. The mining risk in this case has been a progressively decreasing one. The highest risk was taken by the man who sunk the first prospect-hole. Each advance in development warranted the next expenditure, the warrant becoming surer at each successive stage. The final result is a basis for a safe investment of five or six million dollars. The principles illustrated by this example are equally applicable to enterprises of lesser magnitude. A great many failures in mining are due to insufficient development of ore reserves, not to final deterioration of the deposit. If a mine has reserves capable of supplying the reduction plant with ore for only a brief period, and the development during that period should prove unproductive, the company must face a cessation of output while expending money from the reserve fund or fresh additions to capital or it must drop the enterprise. Disaster of this kind has overwhelmed many companies which might have enjoyed long prosperity if ample ore had been developed before indulging in costly equipment. It is but another instance of the wisdom of the rule to make haste slowly. The eagerness to pay dividends, the pressure to compel an engineer to appraise the geological indications, to sanction immediate production, to order smelting works by telegraph, and ship stamp-mills by express, is the sort of folly which has so often brought disrepute upon mining, and substituted emotional insanity for business judgment in the conduct of mining operations. Mr. Requa's article, showing how the thing ought to be done, should certainly encourage the profession and the general public to insist upon conservatism in the great field of metal-production as in all other departments of industry which are supposed to constitute part of the work of a rational world.

The evident conclusion from the example set is that the ore reserves should demonstrate the possibility of recovery of the requisite capital-expenditure. Such a rule would not appeal to the average man with a mine to sell; it is, of course, hateful to the adventurer; but it means safety to the investor, and insistence upon its observance would improve the tone of the metal-mining world as a whole. It would impart to it that sort of stability and healthy expansion which characterizes the development of our coal resources.

Personal.

HENRY BRATNOBER is at Nome.

M. L. REQUA has gone to Nevada.

S. W. ECCLES is on his way to Alaska.

F. W. BRADLEY is near Valdez, Alaska.

F. W. OLDFIELD is in northern California.

CHARLES JANIN was in Los Angeles recently.

R. B. WEDDLE has gone to Honduras and Nicaragua.

TODD C. WOODWORTH, of Ocampo, Chihuahua, Mexico, is at Denver.

E. C. MUSGRAVE is on the west coast of Mexico, near Manzanillo.

F. L. BOSQUI has returned from Los Angeles and gone to Goldfield, Nevada.

J. C. GWILLIAM, of the Kingston School of Mining, is at Conrad, British Columbia.

J. W. BRYANT, representing the Tyee smelter, is at White Horse, in the Yukon Territory.

ARNOLD BECKER has been in San Francisco, but has returned to Nevada City, California.

H. J. MEISEL has been appointed superintendent of the App mine, at Jamestown, California.

T. LANE CARTER, of Johannesburg, is to take a vacation and visit London and the United States.

E. E. CARTER has been appointed manager of the Gold Hill & Iowa mines at Quartzburg, Idaho.

DONNELL FOSTER HEWETT has been in San Francisco, and has returned to Nevada City, California.

R. F. JONES is superintendent of the Arctic Chief copper mine, near White Horse, in the Yukon Territory.

J. H. MACKENZIE, general manager of the Goldfield Consolidated Mines Co., was in San Francisco this week.

J. VOLNEY LEWIS is in northern New Jersey on professional work, where he will be for about two months.

E. A. HAGGOTT, of Los Angeles, was in San Francisco this week. He has recently returned from Sonora, Mexico.

LLOYD B. SMITH, instructor in the Pennsylvania State College School of Mines, has accepted a position with Spurr & Cox, Incorporated.

W. W. MEIN has been appointed consulting engineer and general manager for the Eckstein's Central Administration group of mines at Johannesburg, South Africa.

J. E. SPURR, of the firm of Spurr & Cox, assisted by J. H. Farrell, W. D. Blackburn, and Lloyd B. Smith, is making a complete topographic and geologic survey of the properties of the Helvetia Copper Co., near Tucson, Arizona.

Book Review.

A GUIDE TO TECHNICAL WRITING. By T. A. Rickard. Pp. 127. MINING AND SCIENTIFIC PRESS, San Francisco. 1908. Price $1.

Mr. Rickard has taken the correct and perfectly defensible position that mastery of technique is essential for expression, but he is no hide-bound purist who insists upon reeling off impeccable rhetoric according to unyielding academic rule. He is too full of the warm blood of action to fetter himself or others in that way. Yet we must have rules; there must be known and accessible authority imposing discipline and decorum or we lose that incisiveness which makes speech effective. Mr. Rickard stands for progress, so he lays down rules with the saving clause, "no man can apply a rule intelligently until he understands when to disregard it." The purpose of the book is to give substantial help on the mechanics of style and composition. The usage current among the best writers with reference to abbreviations; the function of the hyphen; the danger of augmentatives that weaken; the good-manners of titles; the correct relations of pronoun to subject; discriminative punctuation; and how to economize the mental effort of the reader; are some of the matters elucidated. It is a handy little volume; bristling with information and stimulus; and a good friend to have at one's elbow when in trouble over some difficulty of expression.

Latest Market Reports.

LOCAL METAL PRICES—July 23.

Antimony	12@16c	Quicksilver (flask)	$45@45.50
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.85@ 5.80c	Tin	31¾@33¼c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
July 17	12.63	4.43	4.43	53
" 18	12.63	4.43	4.43	53¼
" 19	Sunday.	No market.		
" 20	12.63	4.43	4.43	53¼
" 21	12.69	4.43	4.45	52⅞
" 22	12.69	4.43	4.45	52⅞
" 23	12.69	4.43	4.45	52½

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 16. £. s. d.		July 23. £. s. d.
Camp Bird	0 13 0		0 13 0
El Oro	1 3 9	ex div.	1 3 0
Esperanza	1 14 6		1 12 6
Dolores	1 10 0		1 10 0
Oroville Dredging	0 10 6		0 9 6
Stratton's Independence	0 1 6		0 0 9
Tomboy	1 2 6	ex div.	1 2 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, July 23.

Atlanta	$ 23	Laguna	1.10
Belmont	99	Manhattan Con	8
Columbia Mtn	20	Midway	41
Combination Fraction	1.27½	Montana Tonopah	1.40
Daisy	79	Nevada Hills	1.75
Fairview Eagle	40	Rawhide Queen	60
Florence	3.10	Sandstorm	34
Gold Bar (Bullfrog)	4	Silver Pick	19
Goldfield Con	5.70	St. Ives	34
Gold Kewanas	40	Tonopah Extension	87
Great Bend	40	Tonopah of Nevada	7.80
Jim Butler	31	Tramp Con	15
Jumbo Extension	50	West End	66

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES — BOSTON.

	Closing prices. July 23.		Closing prices. July 23.
Adventure	5⅞	Michigan	9½
Ahmeek	71	Mohawk	61½
Allouez		Nevada Con	13
Amalgamated	73	North Butte	75
Arcadian	4	Old Dominion	37½
Atlantic	14	Osceola	102
Bingham Con	75	Parrot	
Boston Con	13⅝	Phœnix	50
Butte Coalition	25¼	Quincy	90
Calumet & Arizona	115	Rhode Island	3¾
Calumet & Hecla	660	Santa Fe	1⅞
Centennial	25½	Shannon	14¼
Con. Mercur	38	Superior & Pittsburg	12¾
Copper Range	75	Tamarack	66
Daly-West	10½	Trinity	14
Franklin	9¼	United Copper Con	6¾
Granby	100	Utah Copper	37½
Greene-Cananea, ctf	11	Victoria	5⅝
Isle Royale	20½	Winona	6
Mass	6	Wolverine	134

Publications Received.

TESTS OF CONCRETE AND RE-ENFORCED CONCRETE COLUMNS. Series of 1907. A. N. Talbot. Bulletin No. 20 of the University of Illinois Engineering Experiment Station.

Year-Book for 1906, Illinois State Geological Survey. Contains the administrative report for 1906, by H. F. Bain, director of the Survey; reports of the co-operative topographic survey of Illinois, by H. M. Wilson; preliminary investigation of Illinois fire clays; limestones available for fertilizers; analyses of silica deposits in southern Illinois; contributions to the study of coal; the mineral industry in 1906.

General Mining News.

ALASKA.

The management of the Tacoma smelter will in the future pay the miners of Seward Peninsula 60% of the assay value of all quartz ore at the time when the ore is purchased, and the remainder on receipt of the smelter returns. This will be of great benefit to the mining industry and will facilitate the development of more mines.——The Nome Mining Co. has started its big dredge on the Bourbon creek, near Nome. It is claimed that this is the largest dredge north of Vancouver. The hull is 109 by 40 ft. and is equipped with seven electric motors. There are 67 buckets with a capacity of nine cubic feet each, the cutting edge being made of manganese steel. The dredge will dig 40 ft. below the water line, and the water can be held ten feet below the surface, making the total depth to which digging is possible, 50 ft.——The Blue Goose Mining Co. has resumed operations at its property near Nome.——The machinery for the new dredge to be erected by J. P. Pearson on Salmon river has arrived and is now being installed.

ARIZONA.

GILA COUNTY.

The King Trail Development Co. has taken a two-year bond and lease, with option to purchase on the Globe & Pinto Mining Co.'s claims, two miles north of Bellevue. The property comprises 14 claims and has been passed upon by mining experts, who class it among the best copper prospects. In one shaft 180 ft. deep, a good grade of sulphide ore is exposed and in another shaft 108 ft. deep there is a 67-ft. cross-cut ending in a vein of sulphide ore not entirely cut.

MOHAVE COUNTY.

A carload shipment of ore from the Connelly lease, on the Flores mine, was made last week.——A station has been cut on the 500-ft. level of the Victor mine and a cross-cut started toward the vein.——The work of enlarging the shaft of the Gem mine, at Cerbat, is progressing rapidly. A number of carloads of timber have arrived and are being put in place.——A contract has been let for a 400-ft. adit at the Blue Lode mine, at Layne Springs.——Charles Metcalfe has let a contract to Burke & McDerwin for the assessment work on his Great Eastern group, in the Wallapai Mtn. district. Work has been started.——The Arizona Southwestern Copper Co. has struck a large inflow of water in its shaft at a depth of 270 ft. When the 300-ft. level is reached a cross-cut will be started and a larger pump put in.

SANTA CRUZ COUNTY.

The incline shaft at the Morning Glory copper mine, in the Harshaw district, is down 140 ft. The vein at that depth is a little more than six feet wide.——Work was commenced this week by the Arizona-Pittsburg M. & S. Co. prospecting the Santa Rita No. 2 group of claims, situated on the Veta Grande, in the Wrightson district.

YUMA COUNTY.

The Cunningham Pass Copper Co., which recently made a $6000 payment on the $50,000 purchase price of a group of four claims, is starting a new working shaft on the great vein, which can be traced the entire length of the claims. Hoisting machinery will be installed and development rushed with all possible speed. The Company now has 52 men at work on the Boone claims, a short distance from the Josephi purchase, and has that property developed so that regular ore shipment can be made from it in future.——The Castle Copper Co. is building a road which will be completed in a few days, over which the new hoist and compressor will be hauled to its property. R. H. Burmister, of Phoenix, is interested.

CALIFORNIA.

CALAVERAS COUNTY.

A pocket of rich gold ore was recently uncovered in the Utica mine, at Angel's Camp.——A large dredge is to be started on the rich tailing in Chile gulch. A company, headed by John A. Bunton, of Coalinga, has purchased the Green Mountain property near Mokelumne Hill.——The Hamby mine, three miles from Mokelumne Hill, is building two dwelling houses, repairing its 20-stamp mill, and getting things in readiness for operation when more water is available.——The Deep Gulch mine has recently started a force of men sinking a winze at the end of its adit.——The North Star mine was closed down last week because of lack of water.——It is believed that work will soon be resumed at the Giuffra mine. A contract for 5000 ft. of timber has recently been given to Albert Erin, of Mokelumne Hill.

ELDORADO COUNTY.

The Woodside-Eureka Mining Co. has resumed operations at its property, near Georgetown. The Eureka shaft will be unwatered and all ore will be hoisted through it.——The Garden Valley Gold Mining Co., at Greenwood, will reopen at once. New machinery has been ordered and is expected soon.——The Gilbert mine reports a strike of very rich ore. The mine is equipped with a 15-stamp mill but lacks water in sufficient quantity to keep the whole plant going.

NEVADA COUNTY.

(Special Correspondence).—Several large stockholders of the Brunswick G. M. Co. have been at the mine the past week inspecting the property and considering future operations. It is reported that a new shaft will be sunk, but nothing official has been given out.——L. W. Jefferson, of San Francisco, is inspecting the Dublin mine on Little Deer creek. Capital is being raised to develop the property.——A new tunnel is being driven to intersect the gravel channel at the Snowden Hill mine. It is expected to attain the objective within 200 ft. The channel ranges from 40 to 50 ft. wide. A new road is also under construction from the main road to the mine. Several surface improvements are being made.——Eastern and San Francisco people, represented by Harry S. Abbott, a mining engineer of Goldfield, have bonded the Lecompton mine for $50,000. The Independence and Treadwell claims, adjoining properties, are included in the deal. The work of unwatering the shaft is under way.—Good results are being abtained by lessees at the Inkmarque. It is reported that the parent company will resume operations soon.

Grass Valley, July 21.

Map of Northern California.

SAN BERNARDINO COUNTY.

A recent strike in the upper adit of the Big Chief Co. exposed a large body of ore assaying about $20, in which there is an 18-in. streak that assays $40. This strike was made at a depth of 100 ft. and the ore very strongly resembles the richer specimens found on the surface.——The

adit on the Bishop & Martin lease has almost reached the intersection with the 50-ft. shaft. The dry concentrator, heretofore used, has been abandoned and the entire dump is being sorted and sacked for shipment.——Active development will be started at the Oro Belle property about August 1. It was planned to start earlier, but definite word has been received to the above effect. The property will be fully equipped with machinery.——The town of Daggett was completely destroyed by fire last week, resulting in a property loss of $45,000 or $50,000.

SIERRA COUNTY.

The Buckingham mine has suspended operations, caused directly by the breaking of a cam shaft. The ore has not come up to expectations.——The Alaska mine resumed operations last week. The new shaft will be unwatered, and when that is completed sinking will be started. Several new pumps, including two of the centrifugal type, have recently been installed and no trouble is expected from the water.

SISKIYOU COUNTY.

The Wright & Fletcher Hydraulic Mining Co., near Greenview, has cleaned up and turned the water out of its ditches. Although it did not make a long run this season, because of a late start, it is understood that the operation yielded some $9000 in gold. It is very rare that any gold is found in these claims, save fine, but this year a number of good nuggets were picked up, the largest being worth about $30.

TUOLUMNE COUNTY.

Acting on permission received from the State, to which the Clio mine had reverted because of the failure of the owners to pay the taxes on it, the property was offered for sale recently at public auction. It was secured by C. A. Belli, of the First National Bank, for $7817.99 for clients. Of this amount $7191.85 is for actual delinquent taxes, with added penalties and costs, and $626.14 interest on a mortgage held by one Henderson.——It is reported that a large vein of free-gold ore has recently been uncovered in the Oakland mine, above Columbia.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The first shipment from the strike recently made in the breast of the Scepter adit, brought a settlement of 397 oz. silver per ton. The orebody is from 2 to 3 ft. wide, 8 in. of which is high grade. This is one of the richest discoveries made in some months on Democrat Mtn. The heading of the adit is now nearing the rich mineral zone of the Sunburst. J. Bowen has resumed work on his lease on the Sunburst, and is carrying a stope on a streak of ore that is from 12 to 18 in. wide. Shipments will be started at an early date.——McGrath & Gardner have taken a lease upon the 125-ton concentrating mill, situated near the dumps of the Stevens mine, West Argentine. From a two-weeks' run, 25 tons of iron concentrates was turned out, which netted $37 per ton. In addition to this 15 tons of lead was sold which brought $70 per ton. The mill is being fed upon dump matter exclusively. These operators will also carry on considerable work in the mine. ——The La Plata group of claims, on Democrat Mtn., is undergoing systematic development. The adit is now in 1300 ft. and a cross-cut is being run to connect with the 6th level of the Silver Glance. The connection will be made shortly, at which time driving will be started on the La Plata vein, cut 1200 ft. from the adit entrance. The machinery for the Mt. McClellan M. & M. Co., which is driving the Mint adit, has arrived and is now being placed in position. The compressor will be run by electric power from the line of Waldorf Co. By continuing the adit 300 ft. the Mint vein will be intersected at good depth.——A fine streak of ore has been uncovered on the Nabob vein, Columbian Mtn. The discovery was made 350 ft. from the portal of the adit, and assays give results of from 150 to 350 oz. silver per ton. G. A. Pease of Georgetown is owner. ——Work is to be resumed upon the Fountaine group of claims, on Columbian Mtn. The shaft will be sunk 75 ft., from which point levels will be run.——The output of smelting ore from the Capital mines now averages 75 tons per week, the value of which is more than $300 per ton in gold and silver. In addition to this 15 tons of lead concentrate is being sold that brings about $300 per ton, and also 40 tons of iron which is worth $29 per ton. It is understood that a set of rolls will be installed in the mill to permit of finer grinding. W. M. Cooper, of Georgetown, is manager.——It is understood that the West Griffith mine, on Griffith Mtn., will shortly be sold to a syndicate of Chicago capitalists, the consideration being $75,000. This property was one of the first shippers of the Georgetown district, and is credited with having produced over $1,000,000. Large bodies of galena ore are exposed on the main level, a portion of which is of a smelting grade. The mine has not been worked for two years, as litigation arose between the interested parties, but all matters were adjusted a short time ago. W. C. Hood, of Georgetown, is the owner.——A large party of stockholders of the Joplin T. & M. Co. was in Georgetown during the past week, making an examination of the holdings. The showing on the Gambetta vein is of such a nature that it was decided to start work upon a new adit, the portal of which will be near the base of Republican Mtn. By driving the proposed adit an increased depth of 500 ft. will be secured under the present deepest workings. B. J. O'Connell of Georgetown is manager.—— John Bowen, leasing on the Frostberg, on Sherman Mtn., has shot into an 8-in. streak of 150-oz. silver ore and is now preparing his ground for stoping. This operator has been at work for over three years and only occasional bunches of ore have previously been found. He has extended the drift until the heading is directly under the point where a production of more than $250,000 was made a few years ago.

Georgetown, July 20.

GILPIN COUNTY.

A company of Colorado Springs men have taken a bond and lease on the Addudell property. The main shaft is now down 560 ft. and will be sunk still deeper. Development work is now being carried on the 200, 300, and 400-ft. levels. The ore will eventually be treated in the company's own mill.——A new and larger plant of machinery will be installed at the Searle mine, in South Willis gulch. Joel F. Vaile, of Denver, is manager.——It is reported that work will shortly be resumed at the Quartz Hill mine, in Leavenworth gulch.

HINSDALE COUNTY.

The Sterling group of claims, near the San Juan county line, has been purchased by F. J. Pienaar. He has advertised for contracts to drive an adit on the Nellie G. claim and will thoroughly develop the group.

SAN JUAN COUNTY.

Frank Pratt will begin work at once on the Excelsior property on Boulder Mtn. He has already sent supplies to the camp.——The Empire Zinc Co. has taken over the mining claims owned by A. S. Sturgone, near Animas Forks, and has started a number of new buildings. A new plant of machinery is contemplated.

TELLER COUNTY.

The production of the Cripple Creek district for the first six months of 1908 was $7,972,247, which is considerably larger than the corresponding production for 1907. The largest monthly output during the half year was in March. ——The regular quarterly dividend of the Portland Gold Mining Co. was distributed last week. The total amount of dividends paid to date amounts to $7,987,000.

IDAHO.

BLAINE COUNTY.

The Bear Creek Milling Co. has recently purchased a 20-ton mill and expects to install an electric power plant at a later date.——The Golden Sunbeam, at Sunbeam, is working 50 men in the mine and mill.——The Dewey has recently cut a seam of galena ore six inches thick at a depth of only three feet.——Six men are to be worked at the Red Cloud group of mines, on Deer creek.

IDAHO COUNTY.

The work of moving the 5-stamp mill from its location east of Elk City to the South Fork mine, on the Clearwater, is now in progress. The sawmill and other equipment ordered some time ago is now on the ground, and the company expects to be milling ore not later than the first of September.——It is reported that recent changes in the treatment in the Butte & Orogrande mill, at Orogrande, have materially reduced the cost and increased the extraction, and that as a result large quantities of ore will now be treated.

NEZ PERCE COUNTY.

(Special Correspondence).—A crew of 15 men is digging ditches and building flume for the Orogrande Placer Mining Co., which expects to install a Rubel elevator this season and get a six-weeks' run.——A Rubel elevator is now being installed by the Rhoades Creek Placer Mining Co. and will be in operation in 10 days. This type of gold-saver is best adapted to the flat bottoms of the Pierce City district.——The big Risdon dredge of the Idaho Co. is working day and night. A duplicate, of the one now working, will shortly be ready for operation.

Pierce City, July 21.

SHOSHONE COUNTY.

(Special Correspondence).—The Golden Chest mine and mill will both be started at an early date. It is now four years since the mill was operated and a considerable amount of repair work will be necessary to get it in shape. The mill has 20 stamps with a capacity of about 50 tons per day, but it is the intention of the company to replace this with a 100-stamp mill.——E. P. Spalding, president of the Coeur D'Alene North Fork Mining Co., which recently took a lease on the property of the Monarch Mining Co., makes the announcement that by the beginning of the year, and provided that the Idaho Northern railroad is completed, shipments at the rate of 200 tons per day will be made from the property. Active development work is to commence about August 1 and will be devoted toward the completion of the raise between the lower and the upper workings. It is estimated that there is already about 30,000 tons of ore blocked out in the upper workings. The property is equipped with a 100-ton mill. The ore will be shipped to the Pueblo smelter, in Colorado.——Work is about to be resumed on the property of the Snow Cliff Mining Co., on the Montana-Idaho divide, near Saltese. It is the intention of the company to drive on the vein to obtain a depth of about 200 ft.——An official announcement has been made to the effect that no dividend will be paid this month on the stock of the Snowstorm mine, at Mullan. The company has been shipping at the rate of from 400 to 500 tons per day and the proceeds are said to have been applied toward the payment of certain indebtedness of the company.——A lead of fully 60 ft. in width has been opened up on the property of the Spokane Tunnel Mining Co., on Placer creek, at a depth of about 400 ft. It is the intention of the company to commence driving to get under the surface showing. A drift to the east of about 600 ft. will give a depth of about 800 ft. on the orebody.

Wallace, July 20.

MICHIGAN.

The railroad line will be completed to the Phoenix mill by July 15. The mine will then be able to begin shipments of 300 tons per day.——Work in the north drift of Lake has been suspended. Sinking and driving are being done in the south drift alone. The next station is likely to be at the 400-ft. level. A remarkably rich showing is noted in the south drift.——The Superior Mining Co. started last week cutting down the No. 1 shaft to three-compartment size. No definite date is set for the beginning of production. Possibly this is somewhat dependent upon the settlement of the Osceola-Calumet & Hecla litigation.——No. 1 shaft of the Allouez has attained a depth of about 2300 ft., and continues to go down at a good rate. The nature of the rock now coming from this shaft is such that the Allouez apparently will not make the showing it did a year or two ago. The mineralization is showing no improvement of late.——Calumet & Hecla is removing the pumps and other machinery from the Keweenaw county explorations to Calumet, indicating a determination to abandon these explorations indefinitely.——Michigan has discontinued work on the new stamp mill in order to conserve funds and thus avoid the necessity for another assessment. The mill could have been completed this fall if the work was pushed. Michigan will continue to use two heads of the Atlantic mill.——The Franklin Junior is shipping the last of the amygdaloid rock stocked in opening the Pewabic shaft. The sinking of a shaft has been started to connect with the upraise from the 23rd-level cross-cut of No. 1 shaft. Stoping is in progress on several levels and a fair grade of stamp rock is being hoisted, though but little mass is obtained. Conglomerate is growing leaner with depth. Franklin Junior's present production is about 15 cars of conglomerate and five of amygdaloid.——James Chynoweth has been elected president and general manager of the Hermina Mining Co. The smelter has been completed and will be blown in early next month. The completion of the Canadian Pacific branch will make direct shipments to the smelter possible.

NEVADA.

ESMERALDA COUNTY.

The Goldfield Syndicate Mining Co., which owns a one-half interest in the Rogers-Syndicate lease, has purchased the Nevada Rockland, one of the old mines in northern Esmeralda county near the old camp of Bodie, Cal. The property was equipped with a mill by Eastern people, who worked it last year on a bond.——The Daisy syndicate, at Diamondfield, will resume shipments this week, having 100 tons of gold ore in the bins. A full force of men are at work.——The Goldfield Con. Mines Co. and the Combination Fraction Mining Co. have entered into an agreement by which the boundary between the two properties will be the vertical plane through the surface lines.——A contract has been let to sink the Hazel Goldfield shaft, on the Laguna, from the 450 to the 550-ft. point. The contract price is $38.50 per foot. If the work is done within 30 days a bonus of $3.50 per foot will be given.——The work of unwatering the Claremont shaft on the Goldfield Con. Mines Co.'s estate began this week, and as soon as it can be retimbered and enlarged, sinking with three shifts will begin.——Frank Hervey Pettingill, of Colorado Springs, Colo., has purchased control of the Jack Bell lease on the Queen Bethania property at Rawhide.——The mines of Goldfield produced during the week ending July 18 a total of 2159 tons estimated to be worth $198,785. During the same period the Tonopah mines produced 4775 tons, of an estimated value of $119,375.

HUMBOLDT COUNTY.

Stauffer, Merchant & Reinhart have taken up their option on the Goldbanks Extension, at Goldbanks, and will develop the property. A strike was recently made on the 140-ft. level, assays from which show $270 gold per ton.——Thirteen lessees are at work on the Badger and Yellow Dog claims, at Seven Troughs, owned by the Fine Gold Mining Co., and a large tonnage of milling ore is being taken out. The Company is negotiating for a four-stamp milling plant.

LINCOLN COUNTY.

Two carloads of machinery have arrived at Pioche for the Nevada-Des Moines Corporation. The equipment includes a 40-hp. gasoline engine, an air-compressor, drills, cars, rails, and many minor accessories. The plant will be erected at once and development started.——It is believed that both the Searchlight M. & M. Co. and the Searchlight-Spokane Mining Co. will be in operation by September 1.——The new cyanide plant of the Quartette mine, at Searchlight, was started last week. One shift of 10 men will be employed.——The Philadelphia-Searchlight has closed down, the reason not being stated.

NYE COUNTY.

A company of California and Eastern men have pur-

chased the Pactolus mine, about seven miles from Atwood. They propose to equip the mine with modern machinery and start active development.——A settlement has been reached by which the various contestants against the application for patents sought by the Manhattan Consolidated Gold Mines Co. have deeded to that Company all territory demanded, and adverse suits have been withdrawn. It is a settlement of far-reaching importance to the mining interests of Manhattan.——Development work is being pushed in Jim Butler ground through both the Wandering Boy and Stone Cabin shafts, the former being used to open up the acreage in the Fraction No. 1 claim, while from the latter that portion of their property lying immediately south of the Tonopah Co.'s claims is being energetically prospected. No ore is being extracted, all work being confined to the developing and opening up of the ground. ——The Homestake King mill, at Rhyolite, will probably be increased to 60 stamps in the near future. This property has developed large orebodies on the 400 and 500-ft. levels which seem to warrant the additional milling capacity. The mill has been in operation but a few days and has been running very satisfactorily.——The Security Reduction Co., owning nine patented claims near Manhattan, is installing a 10-hp. gasoline engine, and in addition to the

Map of Oregon.

20 stamps now in place, is putting in a grinding mill and concentrating tables, and will ultimately reach the capacity of 50 tons per day. The mill will be in operation some time during July.——The Round Mountain Reduction Co.'s custom mill is to be increased to one of 50 tons capacity. An 80-ton tube-mill and larger screens have been purchased.

WHITE PINE COUNTY.

The first copper matte from the Steptoe Valley Smelting & Mining Co.'s reduction plant, at Smelter, was turned out Wednesday, July 15. The smelter is not in full blast yet, due to delay in the arrival of some of the minor accessories. The quality and cost of the blister copper are consideraby better than was estimated.——An order recently issued at the mines of the Nevada Consolidated prohibits the smoking of cigarettes while on duty, on the ground of the danger from fire and the fact that men who smoke cigarettes are not dependable.——The Giroux Consolidated Mines Co. has closed a five years' contract with the American Metal Co. for the sale of its copper.

OREGON.

Three carloads of machinery for the Alameda mine were unloaded at Merlin last week, and it is now being put in place. The new plant will have a capacity of 100 tons per day.——The ore car and track for the electric gold dredge, on Kanes creek, arrived from the foundry recently, and is now being placed in position. As soon as this work is completed the machine will be put in operation. Much interest is manifested in the operations of the machine, as its success or failure will determine the future of the southern Oregon gold-fields as a dredging proposition.——An important strike was recently made at the Success group, in the Sumpter district. It consists of four feet of good milling ore and a streak about six inches wide, which will assay very high.——The Gold Hill, in the Granite district, has been leased by Norman T. Berkely, who has already started a force of men at work. Cross-cut No. 2 will be continued to strike the vein, which should be reached within 100 feet.

UTAH.

JUAB COUNTY.

The Godiva has been reorganized and will issue stock to the amount of $1,000,000. Work will be under way in a short time. The 900-ft. shaft will be deepened 300 ft., and leases will probably be given on the old mine workings.—— The Eagle and Blue Bell mine, which had been idle since last fall, is once more in operation, work having been resumed there last week. For the present most of the work will be carried on by lessees, but later the company will put the old time force upon the pay-roll and commence sending out a heavy tonnage of ore.——Moore & Duncan have been given the contract to sink the first 100 ft. in the new shaft to be started on the Tintic Central Co.'s ground. The shaft is to be sunk on the Dominion No. 1 claim and will have two compartments and a manway. The contractors are now ready to start sinking, the necessary grading having been completed.——The shipments from the mines of the Tintic for the week ending July 17 amounted to 6040 tons of ore and 100 tons of concentrate.——The work of developing the King William ground, at Eureka, will be started soon. The operations will be carried on through the Eagle and the Blue Bell workings.——As the work of repairing the shaft of the Mammoth Mining Co. is being done below the 1100-ft. level, some of the lessees have again returned to their work in the mine, but no ore is being raised to the surface. The repairing and overhauling of the machinery at the property is completed.

SUMMIT COUNTY.

A company of Park City men has been organized to work the Old Glory property in Big Cottonwood districts, near the Queen Bess mine.——The Keystone in Thaynes canyon has started work. All efforts will be concentrated on the adit, which will be driven forward for exploration purposes.——A gasoline engine has been installed at the Copper Apex, and will be used in running a ventilating fan.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Insurgent Gold Mining Co., of Spokane, has granted a six-months' renewal of its lease on the Insurgent mine to William M. Crummer. The lessee will have the privilege of using the machinery of the Pearl Consolidated Mining Co. on the Lone Pine claim, which will permit him the advantage of working the Insurgent mine at greater depth than has ever been attempted before. The Insurgent contains the northeastern extension of the Lone Pine vein and may reasonably be expected to yield some high-grade ore.

Republic, July 20.

OKANOGAN COUNTY.

(Special Correspondence).—The Palmer Mountain Tunnel & Power Co. has completed its pipe line from Tout's Coule creek to the reservoir above the 100-stamp mill. The pipe line is now being extended through the town of Loomis.—— The Kimberly mine, at Golden, is again in full operation and exploratory work is being conducted on both the basic and free-milling ore veins.——Eighteen inches of clean galena has been found in the Crescent mine, which adjoins the Kimberly. The Kimberly has two power drills in continuous operation and is preparing to ship ore.——The Holden Gold & Copper mine, near Lake Chelan, is to be equipped with a five-drill compressor, and drills are to be operated on the three levels.——Work on the Palmer Mountain tunnel, near Loomis, has been temporarily suspended, but operations will be resumed shortly.

Chesaw, July 20.

SNOHOMISH COUNTY.

The Bunker Hill smelter at Ritter, in the Index district, was blown in last week. The plant turns out blister copper and copper matte and has a daily capacity of 75 tons. The Bunker Hill mine and concentrator will furnish half of the capacity of the smelter and customs ore from mines along the Great Northern line in the Cascades and will keep the plant running full blast.——The American Mining Co. is opening up a large vein on its property at Silver Lake, on the divide between the Silver Creek and Monte Cristo districts, and building a sled road over which to haul the ore to the railroad at Monte Cristo. The ore is an arsenical iron silver, $21 in gold and $8.40 in copper. Upon completion of the sled road the company will commence shipping to the Bunker Hill smelter, near Index.

STEVENS COUNTY.

(Special Correspondence).—The mines under development on the east side of Kettle river, near Orient, are steadily improving, and a smelting plant in that neighborhood is expected as a necessity at no distant day. At the Orient the old workings have been temporarily abandoned and a new shaft is being sunk. It is down over 60 ft. in vein matter, which becomes more heavily mineralized as depth increases. The First Thought mine is sending regular shipments of ore to the Northport smelter. The aerial tram, which was out of commission for a few days, is again running smoothly. A rumor that this mine had been sold to English and Scotch capitalists for $9,000,000 has not been verified. The only thing which gives color to the report is the visit of Alexander Sharp, the manager, to Scotland, his native land.——D. T. Hodnett, superintendent of the Valley Dew M. & M. Co., has reported that the adit, for the development of the extension northward of the First Thought vein, has intersected the vein 50 ft. from the portal, at a depth of about 50 ft.; that the vein is there 30 ft. wide, and the ore averages $23 per ton in gold. The mine is about three miles distant from the railway, with half a mile of wagon road to be completed, preparatory to shipping ore, which will be begun as soon as the road is finished.——The Second Thought Gold Mines Co. has been incorporated, with its principal place of business at Orient, Ferry county. The company has taken over the Second Thought group of five claims, which adjoin the First Thought group on the south, and carry the extension southward of the First Thought vein. The group was located ten years ago, but lacked development.——The Trojan mine, on Toulon Mtn., has been opened by an adit 800 ft. long, which tapped the vein at a vertical depth of about 500 feet. The adit passed through vein matter, assaying $136 in gold, before reaching its objective point. Some fine ore has been developed in a winze which goes down from the end of the adit. The property is owned by the Trojan M. & M. Co., Washington, D. C.—— The Gem mine has been incorporated under the corporate name of the Beecher Gold Mining Co. It is situated on Toulon Mtn. and produces ore showing free gold, samples having assayed as high as $90,000 per ton. Work will be started immediately. This property was incorporated as the Judge Mining Co., but another incorporation of the same name in the State made a change in the title imperative. The new company has funds on hand sufficient for a year's active work.——A new strike in the Globe mine, on Toulon Mtn., is a vein of ore four feet wide. It was made in a drift, at an estimated depth of 250 ft., on the main adit level. This strike, added to former developments, gives assurance of a paying mine.——An important strike of pay ore has been made in the lower adit on the Paymaster mine, which has added much to the ore in sight in this property. Arrangements have been made for shipping to the railway, at Orient, in transit to the smelters.——A contract has been let and new work has been started on the Trophy mine.—— A new strike has been made in a 200-ft. cross-cut adit on the Lone Pine mine, on Deep creek. The adit has intersected a 4-ft. vein of silver-lead ore of commercial value, at a depth of 70 ft. The property is owned by British Columbia people.——A spur, six miles long, will be constructed immediately from the Spokane Falls & Northern railway to the United Copper mine, near Chewelah. A new boiler and two Burleigh drills will be installed, and the ore shipments will be increased to 1000 tons per month. The company will open new levels from the winze at every 50 ft. and thus increase the output of the mine to almost double its present production. The raise to the surface will be completed in August. About 36 men are employed, and six four-horse teams are engaged hauling ore to the railway. The final settlement has been made on a bond for the purchase of six additional claims.——A vein of asbestos five feet wide is reported to have been discovered eight miles east of Chewelah, which can be traced a distance of 1200 feet.

Chewelah, July 20.

CANADA.

BRITISH COLUMBIA.

It is reported that the directors of the Ymir Gold Mines, Ltd., have decided to spend $30,000 upon improvements at the mine. The rehabilitation of the mill, the reconstruction of the water flume, and the developing of new levels will be undertaken. Horace G. Nichols, Ymir, B. C., is manager.——E. H. Smith, of Spokane, has purchased a controlling interest in the Maud S. and the Maggie claims, which are a short distance south of Forty-nine creek, in the Nelson district. The consideration was $20,000. Two veins on the property cut each other at almost right angles. One bears gold and copper and the other contains free-milling gold ore.——The St. Eugene mine, at Moyie, shipped over 600 tons of concentrate to smelters in West Kootenay last week.——The management of the Aurora Mining Co. is purhcasing new machinery to develop the property at Moyie.

Following is the tonnage of ore shipped from and crushed at the mines of Rossland for the week ending July 11, and for the year to date:

Mine.	Week.	Year.
Central Star	3400	93,331
Le Roi	1750	44,699
Le Roi, Two	420	13,379
Curlew	....	30
Mayflower	....	35
California-Giant	....	95
Blue Bird	35	145
Red Eagle	....	20
Evening Star	35	523
Totals	5640	152,257

The district shipments were: Boundary, 31,417 tons; Slocan-Kootenay, 1933; Rossland, 5640. Total for the week, 38,990 tons.

ONTARIO.

The output of the Cobalt camp for the first six months of 1908 was 9151 tons as against 6543 tons for the corresponding period of 1907, an increase of 2608 tons. This increase in tonnage does not reflect the actual growth in shipments and value of the output, because of the fact that several of the leading properties have during the year erected concentrating plants and are sending to the smelters only high-grade ore and concentrate. Kerr Lake, Coniagas, Buffalo, and Cobalt Central shipments now consist wholly of high-grade ore and concentrate, and the smelter returns from these shipments run very much higher per ton than those from the ore shipped by the other mines. The month of July will show a large increase in tonnage over the corresponding month of last year. Thus far the O'Brien has shipped 95 tons, the Nancy Helen 93 tons, the Silver Queen 90 tons, and the Nipissing 63 tons of ore, while four other companies have sent carloads ranging from 20 to 47 tons per car. Cobalt Central has a car ready to ship that will run 25 tons of concentrate and will send a second car the last of the month. The last-named company is installing some additional machinery in its concentrating plant for the purpose of materially increasing its capacity and adding to the economies of operation. The plant is now showing an average saving of 92% of metal values; the changes will increase this average to 96 per cent.

Special Correspondence.

NEW YORK.

Financial Improvement.—Ahmeek Mining Co.—State of Copper Market.—Report of International Nickel Company.

During the past week the general tone here has considerably improved, largely attributed to the result of the Denver convention. The betting at Lloyd's on the result of the November elections now stands at 5¾ to 2 on Taft, and business interests have already begun to discount the result of Bryan's expected defeat. There has, however, been a general improvement abroad, which would naturally be reflected in this market. It is, accordingly, unfair to lay too much stress on politics to account for the tone of the market.

There has been more business on the curb-market this week, and while this does not always indicate investment-demand, there has been genuine activity in several stocks, including the Nevada Consolidated and the Mason Valley. The Ahmeek Mining Co. held its annual meeting in Boston on July 3, when the directors were re-elected. The Company is making a gratifying showing of earnings at the present time, but dividends are not in sight, as two new shafts are in progress and a stamp-mill will have to be built; at present the ore is being milled by the Osceola and Tamarack companies. A treasury surplus is being accumulated to meet the cost of this work, and on January 1, 1908, the Company had $14,837 cash on hand.

The general opinion seems to be in favor of a rapid recovery in the price of copper. This metal will always feel the result of an industrial depression longer and more severely than iron and steel, as the latter are being continually used by going concerns, while copper is consumed more particularly in new installations. During the past year many proposed installations have been held up for want of capital, and when confidence returns, the sudden demand is expected to force the price up to 14c. The export movement is still very heavy, having averaged 2,000,000 lb. daily since January 1. This means that more than two-thirds of the copper produced by the mines of the United States, Canada, and Mexico is being exported. While few of the copper stocks are earning enough money at the present price of the metal to warrant a higher selling price, the market is beginning to discount the future, and prices should rise considerably.

The sixth annual report of the International Nickel Co. for the year ended March 31 has been issued. This Company, operating abroad through the Nickel Corporation of London and the Société Minere Caledonienne of Paris has practically a world-wide monopoly. The Company is capitalized for $9,351,836 bonds, $8,912,626 six per cent preferred stock, and $8,822,661 of common stock. It was organized in 1903, and while it has not paid any dividends on common stock it has spent out of earnings about $5,000,000, in smelting and power plants at Sudbury, Ontario. Originally opened as a copper property, the ore has been developed chiefly for nickel. There are said to be fifteen million tons of ore shown up by diamond drills, which will average $30 per ton gross, or over $16 net. Twelve years ago the annual consumption of nickel was 4,000,000 lb., but it is now about 20,000,000 lb. Two years ago the net earnings were $300,000 less than last year, so it is evident that the International Nickel Co., by controlling the output, have been able to maintain their earnings even during an off-year.

The last annual report announced net profits of $1,324,742, after deducting expenditures of $1,548,481 for construction, etc., $215,975 for depreciation of plant, $94,351 for exhaustion of minerals, $168,250 for bond-sinking fund. And after making allowances and payments of bond and stock interests, it reported an additional surplus of $790,000. There was then deducted $300,000 more from the surplus for further depreciation of property. These figures seem to indicate an exceedingly prosperous condition of this company. It is controlled by the same men that made millions out of the early Nipissing boom.

LONDON.

Burma Ruby Mines, Ltd. — Wanderer Gold Mine, Rhodesia.

We have heard recently a great deal about the troubles of diamond mining companies, due to the crippled resources of the buyers of ornaments. It is not only diamonds that are in the shade, but all other precious stones as well. The depression in the ruby trade can be gauged by the present position of the Burma Ruby Mines, Ltd. This company was formed nearly 20 years ago by the Rothschilds to work the celebrated deposits in Burma, where the highest quality of rubies and other corundum spinel stones are found. At the time of flotation there was a mad rush for shares, for it was supposed to be one of the most valuable investments possible. The history of the company has not borne out these early hopes, and the profits have been much less than expected. The capital was originally £300,000, divided into 299,000 ordinary shares of £1 each, and £1000 in founders' shares. The ordinary shares are supposed to receive a dividend of 20% each year, and the surplus profits are then to be divided equally between the ordinary and the founders' shares. Unfortunately this distribution of profits is only theoretical, for the profits have never been sufficient to pay a 20% dividend on the ordinary shares, let alone provide any dividend on the deferred shares. For ten years no dividend at all was paid. From 1898 to 1906-7 dividends varying from 4 to 15% were declared, except in the year 1901-2, when the dividend was passed. For the year ended February 29 last, there was a small balance of profit, but owing to the black prospects, the funds were conserved. During the first ten years of the company's existence the high rent and royalty payable to the Government were a great drain on profits, and upon several occasions the Government consented to reduce the dues. Also in 1897 the company found it necessary to re-organize its capital in order to write off the considerable losses, and the nominal capital was reduced from £300,000 to £180,000 by cutting down the nominal value of the shares from £1 to twelve shillings. It will be noted that the dividends mentioned above were paid on the reduced and not on the original capital. During the last four years over £30,000 has been spent in driving a new tunnel which will serve the double duty of coping with the floods and assisting in the exploration of new ground. The necessity for this drainage-tunnel was made apparent by the extraordinary damage done by floods some years ago. The tunnel is now practically completed.

The ground is worked chiefly by the company, but several parts also are operated by lessees who pay a royalty on their output. The disposal of the company's stones is effected locally and also through London brokers, the amounts disposed of in these two ways being about equal. As regards the present position of the company, it has been found next to impossible to dispose of any of the stones in London during the last nine months. The sales in Burma have not been affected to the same extent, but have diminished by perhaps 25%. What would be the best policy to pursue under the present circumstances is a question that has given the directors great anxiety. It is very undesirable to close down work of this sort in a country like Burma, where the natives have practically no resources. The mines are now working half time. In addition the Government has allowed the fixed rent to stand over for the present. It is obvious that the position of the company is one of great uncertainty, and it is impossible to say what the future may bring forth.

One of the most interesting gold mines at present being worked in Africa is the Wanderer, in the Selukwe district of Rhodesia, where unusually low-grade ore is made to yield a miner's profit. The Rhodesian gold mines have been disappointing owing to their low grade and irregular nature. The Wanderer is of particularly low grade, for the gold content of the ore milled is only 2¾ dwt. The extraction also is only 75%. A few months ago Mr. Letcher gave an account of the district in which this mine is situated. The gold is found in what is called the 'banded ironstones,' a name which is not very descriptive. Perhaps ferruginous sandstone would be better. At the Wanderer some of the

mining is done by open cut and some by underground workings. Owing to the nature of the rock it is difficult to keep the ore and the barren ground separate, and the average of the ore treated is lower than would otherwise be the case. The ore is crushed in rolls and cyanided. During the twelve months from May 1, 1907, to April 30, 1908, the amount so treated was 190,337 tons, and the extraction was 19,565 fine ounces, which realized £83,201. The working-costs were extremely low, amounting in all to £61,638. Of this, £22,224 was spent in mining and tramming, £14,871 in milling, £16,369 in cyaniding, £516 in maintenance of roads and buildings, and £7654 in administration, consulting engineers' fees, and so forth. These expenses amount to 6s. 6d. per ton treated. A nominal mining-profit of £21,563 was left, out of which £4870 was spent in development work, £4906 in machinery, and £4082 in sinking a new main shaft. In rendering the accounts these latter expenditures are charged to capital-account, and allowance is made for depreciation and mine-development redemption. During the year £2919 was also spent in London office expenses, and the actual balance as it appears in the profit and loss account is only a nominal one. Like most Rhodesian companies, it is overburdened with capital. The shares issued represent £400,000. The purchase-price when the company was formed in 1899, was £180,000 in fully-paid shares, and in 1902 further property was acquired for £97,500 in fully-paid shares, bringing up the vendors' consideration to £277,500. In all, £122,500 has been subscribed in cash, of which £36,666 was provided by the British South African Co., £12,500 by the Charterland Goldfields Ltd., and £73,334 by the shareholders in the latter company. Milling commenced in 1902 and has been continuously carried on since. At the present time over two years' supply of ore is ready for stoping. The content is very variable. In some places the gold-assays run to as much as 10 or 12 dwt. over a width of 70 ft. The details of production and cost are given fully, and as is usual with the Tarbutt companies, the gold output is given to four places of decimals.

JUNEAU, ALASKA.

Alaska-Perseverance Mine. — Alaska-Juneau. — Results with Excessively Low-Grade Ore.—Operations on Douglas Island.—Chichagoff Gold Mining Company.

Although the season opened nearly a month late, there is a good deal of activity in Silver Bow basin. The Alaska-Perseverance Mining Co. has 100 stamps at work, treating 550 tons per day. The ore is coming from stopes started from the main level of the Alexander adit, which cuts the lode 1200 ft. deep, on the dip. A stoping width of 15 ft. is being maintained, but the full width of gold-bearing quartz and schist is claimed to be over 80 ft. Seven machine-drills are in use. It is said that 100 more stamps have been ordered and will be erected this summer. John R. Mitchell is superintendent, and he is assisted by David Argall and Byron H. Moore. The Company is controlled in England. Arthur L. Pearse is consulting engineer. The same lode is being exploited in the adjoining property of the Alaska-Juneau Co., controlled by Wernher, Beit & Co., of London. The 30-stamp mill was started for this season on June 25, crushing 150 tons per day. The ore is easily amalgamated and does not warrant the use of concentrators. Last year, in 135 days, the length of the season, 19,798 tons were crushed for a yield of $22,093. The yield was $1.12 per ton; the milling cost was 20.5c. and the mining cost 65.9c. per ton, so that this is one of the lowest grade vein-gold mines in operation anywhere. The lode-channel is schist, traversed by quartz stringers of varying size, and it is worked in open pits, delivering the broken ore to mill-holes leading to adits. About 20% is sorted out. W. P. Lass is superintendent, and Robert A. Kinzie, who is also manager of the Alaska-Treadwell Co., acts as consulting engineer. In the basin below these two mines the gravel deposit formed from the disintegration of the quartz veins is being worked by Emil Kauffman, as lessee from the International Trust Co. of Boston. He has a 5-in. nozzle at work, with 1000 ft. of block-riffles, and 3000 ft. of sluice paved with stone. The conditions for hydraulicking are bad, but rich spots balance the difficulties. In the Gold Creek canyon, leading from Juneau, is the Ebner mine, which has just been sold and a large first payment made. It is planned to erect a stamp-mill on the Gastineau Channel, near Juneau, and connect it to the mine with a tramway. This mine is controlled by W. Ebner and B. M. Behrends, a banker of Juneau.

On Douglas island, the big mills of the Alaska-Treadwell, Alaska United, and Alaska-Mexican mining companies are all busily at work. The Treadwell has 540 stamps, in two mills, 300 and 240 heads respectively. The deepest workings are on the 1450-ft. level, but there is no stoping below 1250 ft. The maximum width of ore excavated underground is 300 ft., the stopes being 75 ft. along the lode, with 25-ft. pillars to hold the ground. Reserves of ore are estimated at 4,664,743 tons, averaging $2.35, with a total working cost of $1.33. The tailing runs 20 cents per ton. Oil has recently been adopted instead of coal for generating steam and the change has proved very advantageous, the economy during the year being estimated at $110,000. Labor conditions have improved, and the strike declared in March has proved ineffective, all the properties being operated at full capacity. The management is doing everything possible to improve the conditions of living, especially for the married employees. Many new cottages have been built, to be rented at a low figure to married couples, it being desired to obtain a permanent population. Experiments in applying cyanidation to re-ground concentrate have proved successful, and a 10-ton plant is being built as the basis for a 100-ton annex. A dam to hold 240,000,000 gal., equivalent to 200 miner's inches for 78 days, is being constructed in the mountain basin two miles south of Treadwell. This will prove a valuable auxiliary when water is low in the ditch. Robert A. Kinzie is general superintendent of the four mines belonging to the three companies already mentioned, and E. P. Kennedy is assistant superintendent. At Sitka there is a revival of interest in gold mining, due to the success of the Chichagoff Gold Mining Co., of which Edward de Groff is president. The mine is on Chichagoff island, 60 miles north of Sitka. The mill contains four Hendy triple-discharge mortars, and one Wilfley table. Murphy drills are used for stoping. The first work was done in 1905 and since then the mine has yielded $100,800. The mill was erected a year ago. The vein is from 2 to 8 ft. wide, and yields $24 to $29 per ton, with $2.34 to $2.63 for the tailing. A new adit, 156 ft. lower than the first tunnel, is now being driven. A. M. Archangelsky is superintendent. The extension of this vein is being opened up by W. P. Mills & Co. of Sitka. At the head of Silver Bay, on Baranoff island, 10 miles from Sitka, are a number of prospects, but not much work is being done. Nicholas Haley is working a promising quartz-vein on Bear creek; this is near the Stewart mine, a property controlled by ex-Governor Brady. On Salmon creek, the Lucky Chance Co. has 10 stamps and a tramway, but the mine is idle. H. A. Bauer has driven a tunnel 1400 ft. He is expected soon at Sitka. There is probability of activity in gold mining in this part of Alaska.

MEXICO.

Railroad From Guadalajara to Mazatlan.—Mining Development along the Route.—Water-Power Plants. — Cyanide Treatment Extending.—New Mills in Hostotipaquillo District.—Carrizo Smelter at Ayutla.

The first spike has been driven in the branch of the Southern Pacific railroad west from Guadalajara by Governor Ahumada of the State of Jalisco. The branch at present starts out from the Orendain station of the Guadalajara branch of the Mexican Central, and the driving of the spike was made the occasion of a feast-day for that part of the country. A special gold spike was furnished, and all the notables of Guadalajara were present; and well may they celebrate the event, for the extension and com-

pletion of this line through Jalisco, Tepic, Sinaloa, and Sonora to Guaymas means perhaps more to the city of Guadalajara than to any other point in the Republic of Mexico. Already, next to Mexico city, which is of course the metropolis of the country, this 'Pearl of the Occident,' as it is called, with its magnificent climate, set in the centre of a rich agricultural country, and on the edge of great mining districts, bids fair to rival even the City of Mexico when, by the completion of the Southern Pacific, it has access to the west coast, and is made thereby one of the most important distributing points for the wonderful mining districts through which the Southern Pacific must pass. Already great activity is noticeable in the mining camps tributary to Guadalajara. The districts that will be more particularly benefited by the extension of the Southern Pacific are Hostotipaquillo, Los Reyes, and San Sebastián. At present these camps are tributary to Etzatlán. Then, out from Ameca, are Mascota, Autlán, Purificación, and Ayutla. These, however, will not be particularly aided by the Southern Pacific Guadalajara-Guaymas line, but, taken with the above-mentioned near Etzatlán, they form the flat side of a semi-ellipse with Etzatlán and Ameca as foci. Within this semi-ellipse the amount of work going on is remarkable, and concessions have been asked based on plans for power-plants on the Ameca river, the Mascota, and the Santiago, for furnishing power to the various districts. Likewise, in connection with the power-plants planned for the Ameca and the Mascota rivers, there is talk of an electric line over the road being built by the Natividad Mining & Milling Co., from San Sebastian to Las Peñas on the Pacific, and another from Cuale to the same point. Following the lead of the Amparo Mining Co., at its Santo Domingo mine near Etzatlán, cyanide treatment is extending, except southwest of Ameca, where copper is the chief metal in the ores. Among the most successful results are those obtained by Louis M. Foutz on the San José de Ventanas ore of the Madera Mining Co., in Hostotipaquillo, where in the dumps and old workings, so far as unwatered, over 250,000 tons have been blocked out, which will give 600 gm. silver and 3½ gm. gold per ton. The extraction is excellent. Other properties in Hostotipaquillo are also said to have obtained equally good results from their experiments, and a number of old patio-haciendas in that district are being fitted up with cyanide plants. In many cases the old patio dumps are being profitably treated by the cyanide process. The first entirely new plant of any consequence in the Hostotipaquillo district, namely, the 30-stamp concentration and cyanide mill of the Virginia-Mexico Mining & Smelting Co., will be in operation before the end of the year. That for the El Favor of Mackeever Bros., a 100-stamp mill, is still in contemplation, but it is stated that a contract has been entered into with the San Pedro Analco Co. for the erection of a $100,000 power-plant at the dam belonging to the latter on Santiago river, whence Mackeevers (or El Favor) will be furnished with 600 hp., and San Pedro Analco with 150 hp. Any surplus may be sold to other operators in Hostotipaquillo. Southwest from Ameca, the Carrizo Copper Co. has completed its 100-ton smelter at Ayutla, and it is understood that a trial run is being made before the rainy season. But dependent as it is wholly upon burros for ores and supplies, it is impossible to keep stocked up during the rainy season. The Bautista mines, near Ayutla, remarkably rich in silver, which have been operated for some years by H. H. Sawyer, for a Philadelphia company, have been advertised for sale at auction to satisfy a judgment of $11,000. Objections were made to the sale, however, by J. H. Howard and H. K. Taylor, who had legal claims against the mines. Ore from this property is remarkably rich in wire and ruby silver, and there is no doubt that intelligent development work thereon would open up a bonanza mine of the first class.

The San Mateo Mining Co., Uruachic, Chih., has completed the 690-ft. adit to cut the vein, and rich silver-gold ore has been struck. The company is planning to put up a small water-jacket smelting furnace. T. A. Ripperdan is general manager.

J. A. Carnahan, of Canton, Ohio, is back of the $12,000,000 company organized to take over a number of prospects at Arichuyvo in the extreme western part of Chihuahua.

The Buena Fé Mining Co., with a capital of $300,000, has acquired some 70 pertinencias (170 acres) in the Ojuelas district and contemplates beginning operations before the end of this month. From Guerrero comes a report that at the Piedra Amarilla mine, of the Guerrero Mining Co., of Chicago, situated in the Balsas river district, a 40-ton oil-smelter is to be erected.

ROSSLAND, BRITISH COLUMBIA.

Mining Institute Meeting.—Consolidated Mining and Smelting Co.—Low Costs at Granby.—Results from Leasing System.

Arrangements are being made by a committee of local mining men for the entertainment of a distinguished party that will visit the mines of this district in September. Members of the Canadian Mining Institute and their guests will visit the principal mining districts of Canada early in September and will arrive in British Columbia about the 15th of that month. The guests of the Canadian Mining Institute on this occasion will be fifteen of the leading mining engineers of Great Britain and Europe, who will represent the several affiliated societies while here. For the purpose of entertaining this party the Dominion Government has set aside $10,000, the Province of Ontario $3000, and British Columbia will appropriate $3000 at least. The Government of Canada is fully alive to the importance of the mining industry, and is ever ready to aid any movement to benefit it. This visit of foreign mining engineers will be a great aid toward inducing foreign capital to invest in the rich mines of this country. At present there are very few mining men on the Continent who have more than a vague idea of mining conditions here, and therefore are not in a position to intelligently direct their clients in investments in this country, but after this party has visited the principal gold, silver, lead, and coal mines of Canada, there will be a group of Continental mining engineers who will have a good idea of mining in this northern land, as far as ore-bodies, working conditions, and profits are concerned.

The Consolidated Mining & Smelting Co. of Canada is making a good showing in its mining operations this season, when existing conditions are taken into consideration. For nine months of the fiscal year ending June 30, the gross value of the output of the mines at Rossland, Moyie, and Phoenix, and of the smelter at Trail, was $4,178,786, which was $100,000 greater than for the entire year of 1907. A favorable report from this company for the year's work is anticipated.

The mining companies in the Boundary have settled down to earnest work, and many little extravagances which were overlooked when copper was at a high price have since been cut off. The Granby and B. C. Copper companies are working steadily and producing a heavy tonnage. It is stated that the Granby is making copper for a fraction over 8c. per pound, and at the rate of 30,000,000 lb. per annum. The Dominion Copper Co. has just begun shipping from its Brooklyn-Stemwinder, Rawhide, and Sunset mines and has its big furnace treating 650 tons of ore per day, but shipments will be greatly augmented after the new 1200-ft. tramway, from the Idaho to the Stemwinder, is built, and after the two smaller furnaces are equipped with electric feed, which improvements will effect a material saving on each ton of ore handled. No one in this district expects copper to remain at its present abnormally low price for many more months, and when the expected rise does take place the Boundary mines will be in an excellent position to reap the benefit. As an example of working conditions here the following table is presented, illustrating the result of the operation of the B. C. Copper Co. for the fiscal year ended November 30, 1907:

	Produced.	Realized.
Refined copper (lb.)	8,643,133	$1,579,907
Silver (oz.)	101,114	67,274
Gold (oz.)	24,967	512,233
Total		$2,159,414

An average of 17.52c. per lb. was obtained for the copper.

More activity is shown in the development of promising prospects this season than for many years past. This is not confined to any single part of the district, but is seen around Similkameen, Grand Forks, Nelson, and Rossland. As a result several small promising mines are now producing ore. Leasing has been much in favor in Rossland this summer, and two properties at least have benefited from the work done, with the result that when the leases cease the companies owning the mines will carry on extensive work themselves. The earnest work of the prospector and small mine-owner is of great economic value to the mining industry, and these men should be given every possible aid, consistent with good practice, such, for instance, as they have been given in the Slocan in the lead-bonus, and in Rossland, Greenwood, and Phoenix in the geological-survey made of those camps.

The Ymir Mining Co. will spend $30,000 in improvement and development of their property. The main orebody having been recovered in the fractured area beyond the fault, still showing good assay-values, the future for the premier mine of Ymir camp looks promising indeed.

CHICAGO.

Coal Market.—Labor Contract with Coal Miners.—Powder-Commission Established. — Provisions of Miners' Qualification Act. — Illinois Petroleum Industry.—Developments near East St. Louis. —Fluorspar and Zinc Production.—Missouri Copper Mines.

The first six months of the year have been full of discouragement for the coal men. The market has been weak, prices have been poor, and there was a long and wearisome series of negotiations before a new labor-contract was made. The contract, as finally entered into, is substantially the old one in all matters of price and conditions affecting costs. The operators failed to get a closed-shop contract, and the miners failed to get the cost of shot-firing transferred to the operators. Despite these facts, the long negotiations were not without results. For one thing, the miners and operators as a whole now know, as their officers alone knew before, the difficulties involved in framing a contract for the entire State, and this strengthens the hands of the conservatives. This is shown in that when recently a member of the union at Springfield, Ill., made charges against President Walker, an investigation was promptly held, and, the charges being unfounded, the man was expelled without protest. Also 52 members at one place in Indiana were expelled for taking into the courts the matter of a fine assessed against them for causing a 'stampede strike,' the union itself paying the operators the amount of the fine.

One of the incidental changes in the State-contract provides for a powder commission, which is to investigate and settle all disputes relating to powder used in the mines, and which also has large powers relating to the investigation of shot-firing devices, the making and grading of powder, and other technical problems. The commission recently organized, with John D. Wilson, Fred Hauck, and Thomas Holmes representing the operators, and George Woodson, Charles Burch, and P. Christianson the miners. It is understood that they are to have the assistance of the State and the U. S. Geological Surveys in their technical investigations. All this will doubtless sound strange to mining men operating in regions where the Western Federation is active, and it is somewhat of a departure for a labor union to be spending money on technical research.

The Mitchell Bill, or Miners' Qualification Act, which was passed at the adjourned session of the General Assembly, went into effect the first of the month. It provides that only certified miners of two years' experience are to be employed. The Attorney-General has decided that the term 'miners' as used in the law applies only to the contract-men responsible for a room in a mine. Heavy fines on both operator and men are provided for any violation, and at first it seemed that all mines would have to close while examinations were being held to certify a working force. However, on assurances from the Governor that if need be he would use the pardoning power to protect men and companies until the necessary boards could be organized and certificates issued, this disturbance of business was avoided.

The oil-production continues to increase. In the first six months of the year the completed wells numbered 1498, of which 1262 gave 34,375 bbl. of new production. In June the pipe lines took 98,859 bbl. per day, and for the first half of the month handled all the oil offered for the first time since the field opened. The service was crippled by a fire, and the last of the month oil was refused in some parts of the field. The pipe-line runs for the first six months of the year amounted to 17,694,759 bbl., with very considerable outside tank car shipments, and 20,352,880 bbl. were stored by the Ohio Oil Co. The pools near Birds, in Crawford county, continue to develop, toward the southeast a considerable number of good wells being brought in every month. In general, however, there has been no pressure for rapid development this year, owing to inability to market the full output. Vice-president Donnell of the Ohio Oil Co. has recently issued a circular letter requesting producers to curtail drilling as much as possible. Approximately half the output of the field is now in storage, and there being no signs of improvement as regards market-deliveries, the company will be obliged to even further reduce its takings. So far it has managed to build iron tanks fast enough to keep up with the output, but there is naturally a limit to this, and unless production is cut there may need to be a period of reduced prices. It is hoped this may be avoided. Up to the present time prices have been steady at 60 to 68c., and the best of feeling has been maintained between the producers and the big buyer. In the western part of the State determined efforts are being made to develop a field adjacent to St. Louis. Land is now leased from Sparta to Medora and along a strip nearly a hundred miles long 'wild-catting' is being vigorously indulged in. A considerable number of small gas and oil wells have been brought in, but so far nothing of commercial importance has developed. Everyone seems hopeful of the final outcome.

Brick and cement plants are feeling the business depression, as was to have been expected. The Rosiclare lead and fluorspar mine is shut down because of lack of market for spar. This is said to be the result of a too ambitious program of expansion last year. The Fairview Co., has not yet got on its feet financially, though their deposits of spar hold out well. The Pierce holdings north of Golconda continue to yield large amounts of 'gravel-spar' which goes to the Illinois Steel Co. The smaller mines are making the usual irregular shipments. While, on the one hand, producers are uncertain as to market, on the other, the steel companies seem equally uncertain as to reserves available for the new open-hearth furnaces. It is a curious situation which should be benefited by closer study and better business organization, since no one who has seen the stopes in the Rosiclare mines can doubt the presence of adequate supplies of spar. In the Wisconsin zinc district and in northwestern Illinois, the mines are resuming, but new work is not being undertaken as it was a year ago. The mill at Platteville, which is 'dry-concentrating' with the use of static electricity, seems to have settled down to a good running gait, and there are, as a result, numerous rumors of consolidations and sales. The latter are more probable since the fate of Consolidated Zinc does not encourage ambitious mergers.

The Missouri-Copper Mountain copper deposits at Sullivan, Mo., have recently been examined by Chicago people with a view to their development on a much larger scale and the building of a bigger furnace. As the property since 1904 has only produced two carloads of blister copper, made, presumably, from the richest ores available and marketed at the time of high prices, it would not seem to afford a basis for expansion at this time. As is fairly well known, however, it and one or two other deposits in the Ozark country are really rich enough, and apparently large enough to support small furnaces during periods of high prices.

BUTTE, MONTANA.

Washoe Smelter Production. — Davis-Daly Co. Re-organization.—John D. Ryan on the Copper Situation.—Great Falls Expansion. —North Butte Extension.—Barnes-King Output.

The Washoe smelter is breaking all records in copper production, treating all the ore usually received in normal conditions in addition to about 40% of the output of the Boston & Montana mines. Production is at the rate of nearly 20,000,000 lb. per month. To this total the North Butte Mining Co. contributes something more than 4,000,000 lb., and Butte Coalition in excess of 2,500,000 lb. on its present limited output. The remainder, about 13,500,000 lb., is credited to the Anaconda, Boston & Montano, Butte & Boston, Washoe, Trenton, and Parrot companies, and to a little custom ore. The Original (Clark) Co. is producing about 3,000,000 lb. of copper per month now, and the only other copper-producer in the district at present is the Pittsburg & Montana Co., which is turning out at the rate of about 550,000 lb. per month. The Original is mining an average of 1200 tons of ore per day at present, which yields probably an average of 4% copper. A year ago ore assaying 8% and upward was shipped as first-class, but 5% ore is now given that classification.

What stockholders of the Davis-Daly Co. have long looked for comes in an intimation from Boston that the re-organization of the company may result in another 'holding' company. Several other plans for a readjustment of the Davis-Daly finances have been considered, but so far as known none has yet been adopted. It is understood that an extension of the payment of the money due the Daly estate for some of the claims owned by the Davis-Daly Co. was secured by the payment of $50,000 in cash. The remainder, said to be $75,000, was made payable under the extension on September 1.

John D. Ryan, managing director of the Amalgamated Copper Co., is authority for the statement that that company has no copper on hand. "The price of metal is low, but there is a buying-demand sufficient to take care of the output," he said. "The metal market is in a healthy if not a prosperous condition. We have no copper on hand at present. We have been selling at a lower price than we would like to get, and I can't say when it will be better. Any revival of the manufacturing business will create a good demand for copper, and will advance prices." Speaking of mining conditions as he found them in Montana on his return from the East, Mr. Ryan said: "With the exception of conditions incident to the losses by flood at the Great Falls smelter, everything pertaining to the copper industry is satisfactory. The smelter will be repaired and started up within four or five weeks. The mines at Butte are doing as well as can be expected. The output of the properties is as large as at any time in the history of the companies, and the cost of production is as low. There have been no disappointments concerning the situation here. Every promise has been made good and more. The people who direct the big concerns operating here are perfectly satisfied." Mr. Ryan confirms the report that he has purchased for himself and others some important industrial enterprises in Great Falls. "I bought for myself and a few friends practically the entire stock issue of the Great Falls Water Power & Townsite Co. This company owns the dam from which the Boston & Montana Mining Co., the Electric Light Co., the Great Falls street railway, and the flour mills of Great Falls, secure their power, and it also owns the real estate that controls a large amount of water power at the falls farther down the river. A great deal of real estate in lots and lands in and about the city of Great Falls is also owned by the company. We bought the property because we believe in the future of Great Falls, which has so many natural advantages, particularly in the enormous power that can be there developed cheaply." The purchase was made from J. J. Hill, and it is generally believed that H. H. Rogers and other Amalgamated copper men are interested with Mr. Ryan in the purchase.

A firm of Chicago brokers is making an effort to re-organize the North Butte Extension Mining Co., the directors of the company having decided to offer for immediate sale $75,000 in notes of the company in denominations of $500, $1000, and $5000, payable on or before six, nine, or twelve months from date, the proceeds to be used in liquidating the company's indebtedness, which aggregated $60,000 on July 1. Of that amount $37,000 is due on the Overman claim, $15,000 in bills receivable, and $8000 on attachments. It is reported that enough of the notes have already been taken to provide for immediate requirements. A. M. Andrews, of Chicago, has been elected a director and treasurer of the North Butte Extension Co., and several attorneys representing the company have been in Butte for some time looking after legal details pertaining to the payment of claims as they arise. It is also said that the directors of the company are planning to provide for a bond issue of $250,000 or $300,000, for the purpose of taking up the notes and to furnish funds for the development of the property. The stockholders will be called to attend a meeting in New

Map of Butte District.

York to consider the proposition. The North Butte Extension is considered to have a fine mining property. Its shaft, which is down 600 ft., is one of the best in the district. Among four or five good veins, the property carries the extension of the Black Rock vein on which the Butte & Superior is sinking a shaft. The extension shaft is being sunk on the Black Crow claim, one of three claims owned by the company outright. On the 300-ft. level a cross-cut was run intersecting the vein, showing it to have a width of 60 ft., but while the character of the vein-filling was good at that depth, the copper content was light.

John Gillie, general manager of the Amalgamated mine and who also is president of the Barnes-King Development Co., ventures the opinion that the latter property is looking reasonably well. It was Mr. Gillie who, after being elected president of the Barnes-King, made an examination of the property and found less than $50,000 worth of ore in the mines to support the capitalization of several million dollars. His report of the condition of the property knocked the price of the stock from about $3 per share to 50c. The new management has been trying to get something out of the property for the stockholders, and gradually a fair showing is being developed. For several months the returns have been in excess of the expenses, and in June there was a net profit of about $8000.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Compressed air for driving vehicles had its origin in a patent issued to Medhurst, in England, August 2, 1800, in which he used compressed air from a reservoir.

The amount of water in a given oil is most accurately determined by means of distillation. The water distilling over with the oil is measured and the percentage calculated from the known volume of oil taken for distillation.

The standard weight of a cubic decimetre of water was fixed by an official body of delegates to a conference held in Paris in October 1907, representing the principal governments of the world. This was determined to be 0.999972 kilogram at 4° Centigrade.

The area of a segment of a circle is approximately equal to two-thirds of the product of the chord and the mid-ordinate. If the ratio of the two be 8 to 1, the area will be correct within about one per cent, and of course correspondingly more correct for greater ratios. The above rule is mathematically correct for the parabola.

Ground limestone is a better material than burnt lime for soils requiring neutralization. Thus it contributes to the life of nitrifying bacteria which liberate nitrogen and potash in forms available to the plant. For this purpose a high degree of purity is not essential, although, as it is the calcium carbonate which performs the office of neutralizing the acidity in the soil, the less silica and alumina present in the stone the better it is. Culls from limestone quarries could be advantageously used in this way if there were sufficient local demand to keep a crusher economically employed. Lands requiring treatment with ground limestone will need from 1½ to 2 tons per acre.

The hydraulic method would undoubtedly be applicable for moving a hill of shale, provided the material be loosened ahead of the stream from the giant, by blasting with deep shots. The plant necessary to accomplish this work is dependent to such an extent upon local conditions, to allow no accurate estimate of cost to be made. Any competent hydraulic or mining engineer would quickly design and estimate such a plant if he had complete, detailed information. A small monitor with a 4-in. nozzle suitable for this purpose sells for $49 f. o. b. San Francisco and weighs 400 lb. shipping weight. Water, under pressure of at least 65 lb. per square inch, would be required.

Coal ash possesses features of value in coal intended for coking, and hence is not to be considered as injurious. The strength of coke depends largely upon the resistance to crushing afforded by the cell-walls, hence the burden which the coke will carry in the blast-furnace is directly related to the amount and chemical composition of the ash. In this relation the ash must be considered as a fusible mixture; it should possess such a balance between the alkalis, iron, alumina, and silica that it will make a difficultly fusible slag corresponding approximately to the formula of a tri-silicate, $2R_2O_3 \cdot 9SiO_2$. The quantity is also important, the best coke being made from coals produced from the Pittsburg seam in the Connellsville basin, Pennsylvania, which contains 7% ash of ideal composition for the purpose stated. In coal considered as fuel only, the ash represents waste-material. Its economic importance as a retarder (hence a regulator) of combustion is not negligible, but ash is invariably present in quantities far in excess of the benefit it contributes in this way. If the quantity of ash in a coal intended for use as fuel directly, exceeds 7% the quantity of fixed carbon present should rise rapidly above 62% to compensate, and if the quantity exceeds 15% the ash should be so low in iron and the alkalis as to produce a pulverulent residue, that is, one which will not fuse and make 'clinker' at ordinary fire-box temperatures, which seldom exceed 1800° C. at any point.

The plenum, or compressed-air process of building foundations under water, or in semi-plastic soil, utilizes a box open at the bottom, on the top of which the foundation proper is built. Compressed air is supplied to the box (called a working chamber) at sufficient pressure to keep the water out, and hence men can, by passing through an air-lock, enter the working chamber to remove the material to be excavated, or to guide the foundation as it sinks. The structure is built in the open air, as rapidly as its own weight causes it to sink. When finally completed the working chamber and the shaft are filled with concrete. In the earlier examples of this method, the working chamber and coffer dam were constructed of timber or steel. In order to eliminate the element of weakness, due to these perishable materials remaining in the finished structure, often causing a plane of separation between the two component parts of the pier, later designers have used a structure built entirely of concrete. The working chamber, shaft, and air-locks are molded around removable steel forms, and hence the entire structure is one homogenous mass, leaving no free space around or in the pier. Another pneumatic method of building foundations under water is called the vacuum process. It consists in exhausting the air from a cylinder and using the pressure of the atmosphere upon the top of the cylinder to force it down. The vacuum should be obtained suddenly so as to have the effect of a blow. The compressed-air process is the more common method and for most cases has many decided advantages over the vacuum process. The latter is applicable only in silt or sand, but the compressed-air process can be applied in all kinds of soil, and the direction of sinking can be accurately controlled.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cornish Pumps.

The Editor:

Sir—In your issue of January 18 occurs a description by E. P. Jones of the No. 2 Cornish pump recently erected at the Berry United mine, Victoria, Australia. I beg to submit some notes on the actual running of the pump, which may be of interest:

NO. 2 PUMP.

PUMP RUNNING 6½ SIX-FOOT STROKES PER MINUTE.

	Dec. 1907.	Jan. 1908.	Feb. 1908.
Gallons raised	34,827,044	34,324,391	32,458,040
Wages and salaries..	£230 4s. 2d.	£244 11s. 10d.	£128 12s. 1d.
Petty cash	12 3s. 6d.	2s. 9d. } 12s. 1d. }	6s. 3d.
Fuel.....	238 6s. 7d.	195 18s. 0d.	200 4s. 2d.
Total cost per month.....	£480 14s. 3d.	£441 4s. 8d.	£329 2s. 6d.
Coal consumed	27½ tons	2 tons	
Firewood consumed	261 tons	302 tons	320 tons
Average consumption fuel per unit*	35.12 lb.	35.94 lb.	35.04 lb.
Average gallons raised per ton fuel	106,814	104,026	106,542

* Unit = 1000 gallons raised 1000 feet.

The length of stroke was increased to 10 ft. and the number of strokes to 8 or 9 per minute. With these alterations the results were:

Consumption of Fuel per Unit.		Average Gal. Raised per Ton of Fuel.
Week ending April 18.....	33.98 lb.	109,870
" " " 25.....	34.89 "	107,006
" " May 2.....	30.44 "	122,657
" " " 9.....	28.06 "	133,051

The total cost of this pump, including erection, and alteration of gear wheel above noted, amounted to £19,000.

NEWTON B. KNOX.

London, June 22.

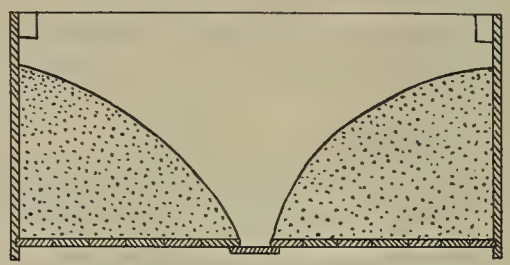
Conical Bottom Tanks.

The Editor:

Sir—With a view to eliciting more information for myself and fellow-workers in the cyanide industry, I take the liberty of giving my answer to a query we have all heard. The question is: Admitting that conical-bottom possess advantages over flat-bottom tanks for slime treatment, but that they are not more commonly used on account of difficulties of construction and supporting, why not build flat-bottom tanks and allow the slime to bank up around the sides and form its own cone?

My experience has been that where this is done, instead of forming a true cone the slime forms as shown in the accompanying sketch, and thus cuts down the capacity of the tank unduly. With a cone built of wood or steel this does not occur unless the angle of the apex is too great. At first glance this seems strange, since we might expect that when allowed to form its own cone the slime would rest at its natural slope, and make an ideal cone, having the maximum diameter and minimum height possible under the conditions. I suspect that this is what does happen, but that the natural slope of slime under water is a dead level. It seems probable that the real explanation of the difficulty with the 'slime cone' is found in the structure of the slime particles, for when examined under the microscope slime is found to consist of flakes and not of grains, like sand. This being the case they will naturally settle on their flat sides, and settled slime (magnified) may be compared to a heap of shingles.

This is my idea of the trouble with the slime-cone



Natural Bottom Formed in Tank by Settled Slime.

and seems to explain why slime will bank up on itself but slide on some other surface. It is clear that if a tank were high enough the slime might pile up in almost perpendicular walls but still admit of a satisfactory discharge of the settled mass. The question is, how high would it have to be? That is, allowing the slime to form its own cone as stated, how high up would the practically vertical walls extend, and how much bigger would such a tank have to be than a conical-bottom tank of the same settling-capacity and any given dimensions?

The term 'settling-capacity' is a hard one to standardize so I will advance tentatively the following definition which will serve well enough for purposes of comparison: the number of cubic feet of pulp per hour flowing into a tank at a dilution 3 of solution to 1 of dry slime, the overflow of the tank to be clear solution and the underflow pulp thickened to 1 of solution to 1 of dry slime. If anyone has a better definition let him give it, and at the same time tell us what he knows about slime settling-cones.

WALTER NEAL.

El Oro, Mexico, June 30.

Separation of Slime.

The Editor:

Sir—An article appearing in your issue of April 25, entitled 'The Separation of Slime in Cyanide Treatment,' by Horace G. Nichols, has brought to my notice a subject that has apparently received little attention, but one which should be thoroughly understood by those engaged in the operation of slime-plants. Mr. Nichols seems to understand his subject, and he has presented it in a very interesting manner; but as his subject is not as new to some cyanide metallurgists as he apparently believes, and as I have understood it for several years, I desire to discuss and emphasize some of the points mentioned by him.

It may be of interest here to note that two of my

friends covered a similar field of investigation in South Africa about ten years ago. They have since devised a process, which is broadly covered by patents, embodying all the principles mentioned by Mr. Nichols, as well as others that carry the subject still farther. That a mixture of dry slime and water has a definite specific gravity, which varies with the percentage of solids, is commonly known and applied in the operation of cyanide works, but that the mixture behaves like a dense liquid is often overlooked. Slime-pulp, which is not in a state of agitation, tends to settle and the percentage of moisture decreases toward the bottom of the vessel; also the specific gravity of the mixture increases in the same direction, so that the variation will be from 1 at the top to that of the caked slime at the bottom. A particle settling in such a medium has, therefore, an increasingly slower rate of settlement, or an increased retardation, as the density of the pulp becomes greater; it follows therefore, as Mr. Nichols has pointed out, that the rate of settlement will be increased if the densest or lowest stratum is continuously removed. The rate of settlement does not, however, depend entirely upon the density of the pulp but upon various factors such as the dilution of the pulp; physical and chemical character of the slime; size and shape of the particles; chemical constituents of the solution; uniformity or non-uniformity in the size and specific gravity of the particles; depth and diameter of vat, and so forth.

Mr. Nichols' two laboratory experiments demonstrate clearly the influence of dilution and relative depths of pulp upon the rates of settlement, and his process, in common with that of my South African friends, is distinctively a continuous process. The great objection to such a process, as compared with filter-presses, is in the enormously greater amounts of solution to be pumped. Such a process, however, permits of more thorough washing and the cost of maintaining and operating it would be very light indeed. I suggest that the low percentage of moisture, in the first sample (Table 6 of Mr. Nichols' article), is due to the large amount of granular material probably contained in it. All the fine sand and sulphides would have settled within 15 minutes, and these would make a denser cake than the more flocculent material, which settled later. Such being the case, the average moisture in practice would probably be between 25 and 30%. I know, however, that it is entirely feasible to obtain settled slime containing 22 to 30% moisture, and to remove it as fast as it accumulates.

The arrangement of the particles of slime has an important bearing upon the percentage of contained moisture, and, in the operation of a filter-press the percentage of moisture in the residues will depend within certain limits, upon the way the press is handled, the pressure employed, and the manner of charging. As a case in point, take the cakes formed in a Dehne press, consisting of an average amount of granular material, and containing about 25% moisture; such a cake would be very solid and apparently quite dry. If, however, dry slime be mixed with water in such a proportion as to contain 25% water, the mixture will be fluid and run like thick molasses.

As regards over-sliming, cases are not infrequently observed where the pulp is ground finer than is necessary for purposes of extraction, simply to enable the agitation plant to treat the pulp mechanically. Such a misfit plant has no excuse nowadays and it is a relief to know that, from a treatment and mechanical standpoint, it is no longer necessary to worry as to whether the ore is suited to treatment by the cyanide process or not. It is now feasible to treat anything from boulders to slime. Slime can be leached and coarse sand can be agitated, so that between the two all possible variations can be pretty well covered.

H. T. Willis.

Champaign, Illinois, May 7.

Cost-Keeping.

The Editor:

Sir—One of the essentials of successful mining consists in the keeping of costs. To accurately follow and control the itemized cost in each department is an essential to an economical production. It is impracticable to personally supervise operations in any undertaking, whether mine, factory, or business, except in small concerns. The time comes in any organization when operations are entirely beyond personal observation and control. It is then that a perfected and detailed system of costs is of essential importance to a mine manager. The ideal manager is he who, while never having to leave his office, yet is perfectly posted by daily, weekly, and monthly reports and cost-sheets. In other words, everything must come to him and be self-explanatory. A daily labor-sheet handed him that same day will tell him far better how many men are employed and how disposed, than by a tour of the surface or underground. It is even possible in some undertakings to strike a rough daily balance of profit or loss.

From labor tickets is compiled the daily labor-cost, segregated into the several accounts of each department. These are then entered on the day-line of the monthly sheet, and thus at the close of the month costs are rapidly and accurately ascertained. All such sheets should be of standard size, colored for the several distinctive classes of labor, and filed in loose-leaf binders. To facilitate the charging of both labor and material it is advisable to adopt a definite number-scheme, so that each item shall be specifically charged, and shall be immediately available to the cost-clerk. It is suggested that the mine have numbers, 100 and upward; the milling department, 200 and upward; the mechanical, 300 and upward; the general expenses, 400 and upward, and construction numbers beginning at 500. The advantage of this scheme is that one sees at a glance to what department the cost is to be charged. For special work in the shops, perhaps the issuing of a job-order ticket, to be returned when completed, with time and charges, is as good as any. The miscellaneous small jobs that pass through the shop are always fruitful of trouble. Most large establishments have such a scheme.

There seems to be too large a latitude in the charging of costs. Many are unintelligible and some appear to be actually false. Such costly items as development, timbering, pumping, and general charges are switched around in the office, and are either buried where desired, or even run into construction-accounts. This is probably due to lack of intelligent information. With a definite number-scheme, there are few items on which the cost-clerk has the option of a private opinion. All numbers are not accurately given, but the errors are not serious and are often detected. Revenue account is kept entirely distinct from construction. In mine-development, for instance, there is always latitude for personal expression. This should be governed by the manager, on lines definitely laid down, and thus be returned to the office. It seems desirable to keep development costs down to the lowest figure, and charge as much as legitimately may be possible direct to stoping. All work in connection with the blocking out or breaking down of ore goes to the stoping account direct.

Development should be a distinct asset to the mine. For instance a main working drift would be chargeable to development, while the intermediate drifts and cross-cuts to the ore would be a charge against stoping. Some firms do not carry a development account, claiming that if the ore does not meet the costs from month to month, or from year to year, the sooner they know that fact the better.

A restricted development account is desirable to spread certain costs over a period of years. To bolster up stoping costs at the expense of development account is inaccurate. To carry an inordinately large development account and then at the end of the year magnanimously write off, in part or whole, against the alleged profits, is also fallacious, unless such writing off is recognized as an operating expense. Under normal conditions development is a working cost and should be treated as rationally and candidly as any other working cost.

H. E. West.

London, May 20.

Sampling of Mine Dumps.

The Editor:

Sir—The article on 'Sampling of Mine Dumps,' which appeared in your issue of May 23, brings to mind a method which I employed some years ago in the determination of the volume of two old Spanish dumps. These were situated on a steep mountain-side, along the crest of which out-cropped the vein. About 20,000 tons had accumulated from an open-cut working, and another pile of about 52,000 tons had been discarded at the mouth of a cross-cut tunnel 400 ft. deeper. Exigencies of time prevented the sinking of shafts for sampling, but it was known that little or no work had been done outside of the orebody by the Spanish and Mexican operators; that the dump surface represented the discarded material from poor stopes; and that it had been sorted over several times during the past 25 years. Thorough surface sampling established the fact that for the particular locality, the discarded quartz was of sufficient value to warrant its being considered fair pay-ore, and, in view of the reasons set forth above, and of the fact that the mine had gone through several 'bonanza' periods, it was considered reasonable to accept the value thus obtained as being a conservative figure for the pile. In the absense of shafts to ascertain the depth and tonnage at different points, the determination of the volume was made as follows: The mountain-side was cut by many small gulches, pretty well defined, and it was considered probable that the evidence obtained from a topograhpical survey of the surrounding ground would fairly define the ground-surface under the dumps. The survey of the dumps and adjacent hill-sides was therefore made with this in view; careful note taken of the limits of the former, and of the gulches and depressions on all sides. These notes were plotted to 5-ft. contours, to an assumed datum; the hill-side contours drawn in solid black and the dump-surface contours in red ink. The gulches and depressions now shown plainly by the black contours, were examined with a view to determining their probable continuation under the dump, and these positions were then sketched in, to serve as a guide for the change in direction which would result in the contours at these points. Those assumed under dump-contours were now dotted in with black ink, and made as consistent as the evidence would warrant.

We now have a plan, the dotted black and red contours of which, for the same elevation, circumscribe horizontal sections of the dump at 5 ft. vertical intervals, and if the assumed contours are correct, we could, by the aid of a planimeter and the prismoidal formula, accurately determine the volume and tonnage. In the absence of a planimeter a 10-ft. cross-section sheet was prepared on tracing-cloth to the same scale as the drawing, and tacked over the latter.

It is evident that the vertical depth of the dump at any point, may be found by noting the dump-surface and 'under-dump' ground-surface elevations at that point; thus, at the intersection of a red and dotted-black contour, the depth would be the difference between the elevations represented by the respective intersecting contours. By this means estimate for the depth of each 10-ft. square was made and noted, and the aggregate volume and tonnage determined. Some time later, shafts were sunk many samples were taken and the assay returns gave a result more than 50% higher than the value indicated by surface-sampling. The value of the different strata accurately told the story of the mine's bonanza days. The most interesting feature of the sinking, resulted from the very close check on the assumed 'under-dump' contours. In some cases the depth proved greater, and in others less, but these differences so nearly compensated, that the original tonnage estimate was allowed to stand.

Stuart L. Rawlings.

San Dimas, Durango, Mexico, July 2.

Glacier ice is now used by some of the larger consumers of Lyons, France.

THE GENESIS OF BENDIGO AND CARRICK LODES, OTAGO, NEW ZEALAND.

Written for the MINING AND SCIENTIFIC PRESS
By JAMES PARK.

In *Bulletin* No. 5 of the New Zealand Geological Survey, lately issued, I have given a detailed description of an interesting group of gold-bearing lodes at the Bendigo and Carrick goldfields. The lodes are enclosed in a moderately hard mica-schist of Paleozoic age. The schist is singularly free from folding, but is traversed by a series of powerful faults be-

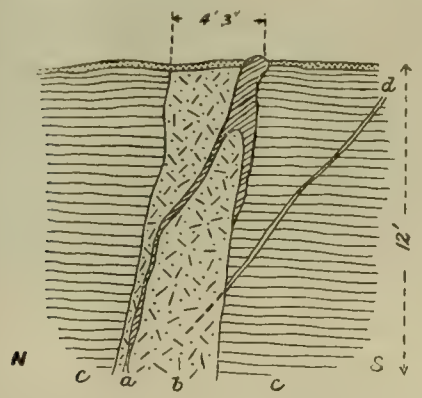


Fig. 1. Cross-Section of Cromwell Lode, Bendigo.

a. Quartz vein. *b*. Crushed schist. *c*. Mica-schist. *d*. Foot-wall vein.

tween which wide strips have subsided, forming valleys and lake-basins, or what German geologists would call *graben*. The strips that were left standing now form one of the most interesting groups of 'block mountains' to be found in any part of the globe. These table-topped mountains were first brought to the notice of geologists by myself in

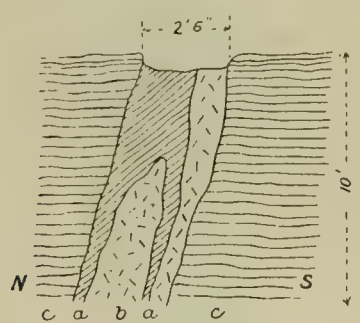


Fig. 2. Cross-Section of Alta Lode, Bendigo.

a. Quartz vein. *b*. Crushed rock. *c*. Mica-schist.

Bulletin No. 3, issued last year. A noticeable feature of this region is the absence of dikes and igneous intrusions. The country is high, arid, and bare, the meagre rainfall of 12 to 15 in. per year being insufficient to support more than a scanty vegetation. It is in this region on the margin of the Cromwell basin that the Bendigo and Carrick goldfields are situated.

A close investigation of these lodes shows that they are 'lode-formations' rather than true lodes. By this I mean that they are mineralized zones of crushed rock. Their main characteristics are so persistent and distinctive that they form a type of lode for which the name immature replacement lodes seems a not inappropriate designation.

As I have pointed out in *Bulletin* No. 5, previously mentioned, and here largely reproduced, the chief characteristics of this type of deposit are:

1. They lie between two parallel fractures, on which more or less faulting has taken place.
2. They traverse the country rock independently of the planes of bedding or foliation.
3. The lode-matter lying between the walls consists mainly of crushed rock traversed by veins of quartz.
4. The crushed rock is more or less silicified and replaced by quartz. The extent of replacement is variable, even in the same lode.

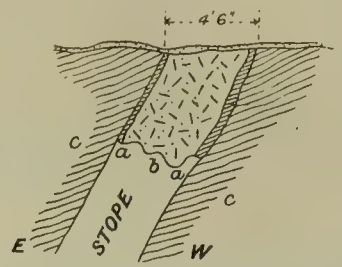


Fig. 3. Cross-Section of New Caledonia Lode, Carrick Range.

a. Quartz vein. *b*. Crushed rock. *c*. Mica-schist.

Commonly the quartz was deposited first along the walls, giving sometimes, as in the case of the Caledonia lode on Carrick Range, two opposite, parallel, and contemporaneous veins separated by a zone of crushed rock. In other cases the quartz was deposited on one wall only. In some places the crushed rock is replaced by vein-quartz from wall to wall, but in all the lodes the bulk of the lode-filling is crushed rock. Where the first condition prevails we have what might be termed a true quartz vein, and where the latter condition prevails, a 'mullocky lode.' Between these two extremes we can trace every stage in the evolution of the massive quartz-

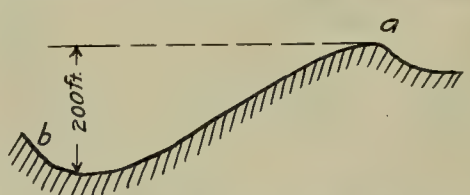


Fig. 4. Longitudinal Section of Lode, Showing Depth of Pay-Ore.

vein; and in this we have a valuable and instructive object-lesson in the genesis of ore deposits that occur as veins.

The veins traversing the crushed rock consist of crystalline quartz, sometimes containing a small proportion of scheelite and pyrite. They generally lie nearly parallel to the walls, and are subject to great variation in size and direction, even in a short distance. In the blue unoxidized ground the rock and quartz are often brecciated and strongly slickensided. It is obvious that wall-movements took place

during the formation of the quartz veins. At Bendigo the lodes traverse almost horizontal mica-schist, and at Carrick Range they traverse strata which are generally steeply inclined. At both places there is entire absence of igneous rocks. The fault-fractures in which the lodes lie are local, that is, they have no tectonic or structural significance, and in the absence of igneous rocks showing at the surface we can only conclude that the fissuring was caused by the intrusion of an abyssal magma that solidified so far from the surface as still to remain uncovered by denudation. The presence at Bendigo of scheelite, and the somewhat rare tungstate of lime, at Carrick Range of antimony, and at Waipori of cinnabar in similar lodes, would tend to support the contention that the metalliferous emanations and solutions ascended from below by cracks and fissures connected with the intrusive magma. The formation of a simple fissure, or even of a system of more or less parallel but distinct fissures, in rocks subjected to tension or shear is easily understood; but in the case of these lodes we are dealing with twin fissures, enclosing between them a narrow slice of country rock commonly crushed and more or less replaced by quartz. The mechanics of the stress or stresses that led to this twin fissuring is at present difficult to explain satisfactorily. The unusual character of the Otago lodes at Skippers, Macetown, and Waipori was noticed by T. A. Rickard* as far back as 1893. He thinks they belong to a type of ore deposits more common than is supposed.

Concerning the age of the lodes only the most meagre information is deducible. It is certain, however, that the lodes existed and were subject to denudation during the Pliocene period, since gold-bearing quartz derived from them is found in the Pliocene quartz drifts. They exist in rocks of probably later Paleozoic age, and are undoubtedly older than the Pliocene. But there are no data that would permit of ascribing them to any definite period.

The arrangement of the old workings leaves little doubt that the best returns were obtained in the upper part of the oxidized zone, at a depth generally less than 50 ft. below the outcrop. It has already been stated that rich pay-ore followed the contour of the ground, but did not descend vertically to a great depth. The ore was not equally rich everywhere along the outcrop, but no information is now available as to the length or pitch of the various pay-shoots.

Take the following case: Let Fig. 4 represent the longitudinal section of a gold-bearing lode. Let the shaded portion represent the depth of pay-ore, and let the top of the hill at *a* be 200 ft. above the hollow at *b*. To say in this case that the lode contained pay-ore for a depth of 200 ft. because *a* is 200 ft. above *b* would be incorrect, for the depth of pay-ore is, relatively to the surface, the same at *a* as at *b*. If pay-ore were proved by a shaft, drift, or cross-cut to exist 200 ft. vertically below *a*, only then would it be correct to say that pay-ore existed down to that depth. In the example, a drive at *b* on the line of the lode would soon run out of the pay-ore. It is also obvious that a cross-cut from the hillside at any point 40 or 50 ft. below the outcrop would pass below the rich ore into poor ground. With lodes of this class, long low-level drifts and cross-cuts seldom or never meet with success. The best practice is to keep on, or as close to the gold ore as the local circumstances will permit. The manner in which the pay-ore follows the outcrop clearly establishes a definite relationship between the surface-form of the ground and the zone of enrichment.

The blue unoxidized ore from the deep ground at Carrick Range was commonly lean, being seldom rich enough to pay for working out. In the brown oxidized ground the ore was generally highly profitable, and, as we have just seen, descended to a limited depth below the outcrop, whether on the hilltop or steep slope. Hence we have reason to believe that the rich ore in the oxidized zone is the result of what is termed 'secondary enrichment.' In accordance with this principle it is assumed that as the outcrop of the lode during countless ages became worn down by denudation the gold was liberated. A portion of this gold was carried into the neighboring washdirt, while another portion was dissolved by mineral acids, liberated from the decomposition of the contained iron-sulphides, and carried downward in solution through the upper oxidized zone, where it was re-deposited in the crushed rock and clay, thereby enriching the existing lean ore, which thus became payable. The precipitation of the gold in this process of concentration presents fewer difficulties since Skey, Kohler, and Weed have shown that clay and finely divided mineral matter possess the power of absorbing or extracting metals from their dilute aqueous solutions. In secondary enrichment we also have a satisfactory explanation of the circumstance that the rich pay-ore follows the contour of the ground along the outcrop of the lodes.

A volumetric determination for lead given by Bollenbach is as follows: To the Pb solution is added NaOH in amount sufficient to re-dissolve the precipitate which at first forms. The mixture is then diluted to a known volume, and 50 c.c. of this is run slowly into an excess of standard $K_2Mn_2O_8$ of known volume, which has been mixed with 400 c.c. of hot water, and 5 c.c. of an 8% NaOH solution. Agitation while mixing the solutions is necessary. The excess of $K_2Mn_2O_8$ is then determined by the use of $N/10Pb(NO_3)_2$ solution, the end reaction being the disappearance of the pink color, in the supernatant liquid. The reaction occurring is:

$$6Pb(NO_3)_2 + 2KMnO_4 + 12NaOH = 2MnO_2 + 3Pb_2O_3 + 2KOH + 12NaNO_3 + 5H_2O.$$

Coal production of the United States for 1907 as given by the U. S. Geological Survey amounted to 480,450,042 short tons having a value of $614,831,549. As would be expected Pennsylvania produced more than any other state, being credited with 236,000,000 tons, of which almost exactly two-thirds was bituminous coal. Illinois, Ohio, and West Virginia rank next to Pennsylvania in the order named. Idaho, Nebraska, and Nevada combined produced only 7588 tons.

* *Trans.* Am Inst. Min. Eng. Vol. XXI, p. 425.

REINFORCED CONCRETE TANKS.

Written for the MINING AND SCIENTIFIC PRESS
By L. MESS.

The improvements obtained in the last few years by using reinforced concrete for the most difficult kinds of construction is to be considered at least as important as the progress obtained in mechanical and

Fig. 1. Concrete Wine Tanks, Bordeaux, France.

electrical engineering. One of the latest adaptations of reinforced concrete is to the construction of tanks for water, oil, gas, cyanide solutions, slime, and for all common as well as corrosive liquids. Europe has been several years ahead of the United States in this work. The first attempt in this direction was by

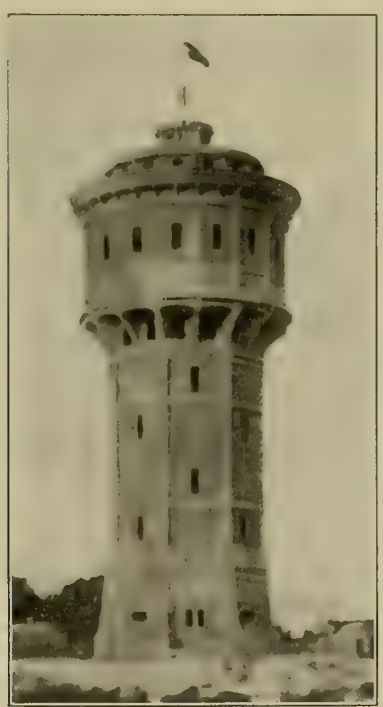


Fig. 2. Concrete Water Tower, Riva, Russia.

Joseph Monier at Paris, said to have been the production of cement flower pots and vessels large enough for shrubs and trees. As early as 1868 he had employed the new material in constructing water tanks of large capacity. The success of these was so great that in a few years Monier's reinforced concrete was extensively adopted in Germany and Austria for tanks and reservoirs.

Fig. 3. Concrete Water Tanks, Ekaterinslaf, Russia.

In the United States one of the largest concrete water tanks is in the town of Attleboro, Mass. Attleboro was supplied with water up to the spring of

Fig. 4. Concrete Coal Pockets, Lence, France.

1904 from a wrought-iron stand-pipe 30 ft. diam. by 125 ft. high, holding 600,000 gal. of water. In March 1904 a break in the line, immediately after a fire, showed the authorities the necessity of building

another and much larger water-storage reservoir to hold 1,500,000 gal. The water of Attleboro, though of excellent quality for domestic and manufacturing purposes, contains carbon dioxide in such quantities as to attack wrought-iron and steel and to greatly shorten the life of an iron stand-pipe, nearly two tons of rust being taken out of the old stand-pipe annually. On making estimates for the new reservoir it was found that one made of reinforced concrete would cost about $3000 less than if built of steel. The structure as built is 50 ft. diam., 106 ft. high, with walls 18 in. thick at the bottom and 8 in. thick at the top, the batter being all on the outside of the wall. The inlet pipe rises to 40 ft. above the bottom and the water is compelled to leave the tank through a 24-in. pipe in the bottom, thus insuring circulation. Above the top, cornice openings are made all the way round the tank, affording a uniform exit for the water in case of overflow, so that no washing of the concrete can occur at any one place. On one side rises a wrought-iron ladder, held in place by bronze bolts.

A remarkable elevated tank of reinforced concrete was recently built for the Anaheim Water Co., at Anaheim, Cal. It is the first tank of its kind ever constructed in the United States. It is 32 ft. diam. by 38 ft. high, supported on concrete posts 70 ft. high above the ground. It has a capacity of 200,000 gal., and is made throughout of concrete, reinforced with rings and vertical members of twisted steel. The walls of the tank are 3 in. thick at the top and 5 in. at the bottom. When tried and tested it was found to be as tight as a bottle, without appreciable cracks. The floor is supported by concrete beams radiating from the centre, and the twelve posts, each 16 in. square, are stiffened by two lines of horizontal struts at equal intervals above the base. The foundation of the tower consists of a heavy slab of reinforced concrete extending 4 ft. into the ground. The tank has a conical-shaped roof, also of concrete, 2 in. thick, with a cornice over the edge, slightly raised to afford ventilation for the water within. From the lowest foundation to the extreme top the tower has a height of 112 ft. It is graceful in outline, and yet gives a pleasing appearance of massiveness and solidity. The cost was about 75% of the lowest estimate on a steel tank and tower of equal dimensions.

The water tower recently built at Fort Revere, Boston Harbor, is one of the most interesting examples of deep-tank construction in the United States. From the ground surface to the apex the height is about 93 ft. The tank inside the tower has a diameter of 20 ft., leaving an annular space between the tank and the inside wall, which is occupied by a spiral stairway leading to the observatory.

Reinforced concrete tanks have repeatedly been proposed for use as cyanide tanks, slime tanks, solution tanks, as well as leaching and percolation tanks. Though the cost of reinforced concrete tanks depends on the shape and size, yet the cost is not in the same degree dependent on the size as is the case with steel or wooden tanks, that is to say, larger reinforced concrete tanks are proportionally cheaper than steel tanks. The durability of steel tanks is limited to about 20 years at most. In countries with a changeable climate the limit is from 7 to 8 years. In countries with hot climates steel tanks may warp after 2 or 3 years. Therefore, in spite of all their disadvantages, wooden tanks are generally chosen because of their freedom from the drawback of rusting which destroys steel tanks. When cement can be had at reasonable rates there is no doubt that it should be employed in preference to either steel or wood in the construction of mill-tanks. With ordinary reinforcing they will resist vibration indefinitely.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

W. M., Manhattan, Nevada: No. 1, pyrite in quartzite; No. 2, traces of graphite in crystalline limestone; there were seven unnumbered pieces.

S. G. M., Hermosillo, Mexico: No. 1, quartzite with iron stain; No. 2, pyrolusite, hydrous oxide of manganese, pseudomorphous after manganite.

J. W. O., Piute, Cal.: No. 1, quartz with talc, somewhat crushed; contains pyrite and a trace of chalcopyrite; No. 2, greatly altered basic biotite-granite.

A. B. R., Hart, Nevada: No. 1, crystallized magnesian or dolomitic limestone; No. 2, silicified rhyolite with some sulphides in white seams; No. 3, biotite-granite.

W. G. S., Custer, Idaho: No. 1, augite-andesite, with feldspar crystals partly kaolinized; No. 2, altered andesite, showing small seams filled with limonite. Action of mineral waters.

O. B. A., Chloride, Arizona: No. 1, schist; an altered, very fine-grained sediment; crystals, probably sillimanite, throughout; has been acted upon by carbonate waters and filled with carbonates of lime and iron; No. 2, hornblende-andesite; the hornblende is now converted wholly into limonite.

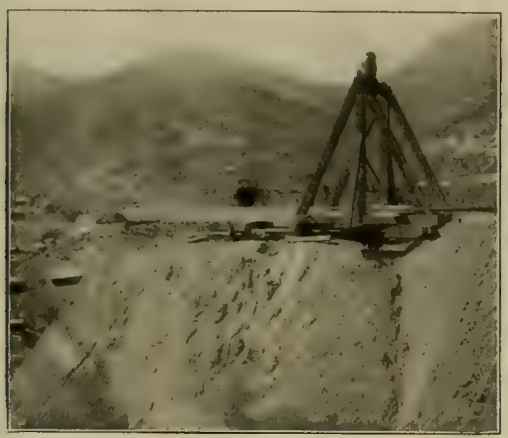
F. J. G., Grass Valley, California: The MINING AND SCIENTIFIC PRESS does not analyze rocks. The specimen sent is too highly decomposed for precise identification. It now consists of limonite and chlorite. The chlorite was probably derived from hornblende, and the rock seems to have been originally a basic igneous plutonic, a hornblendite.

A. J. Boyer, Nevada: No. 1, andesite, greatly altered and containing chalcopyrite changing into chalcocite; No. 2, schist fragment with chalcopyrite, chalcocite, and malachite; No. 3, sintered mass left after decomposition of sulphides; contains limonite, cuprite, and malachite in decomposed rock; No. 4, bornite with malachite and limonite; good copper ore; No. 5, andesite, decomposed and partly filled with malachite.

TAILING DISPOSAL AT MERCUR, UTAH.

Written for the Mining and Scientific Press
By H. W. MacFarren.

The product of the Golden Gate mill of the Consolidated Mercur Mining Co., after being crushed dry is treated in 27 rectangular iron vats, 25 by 50 by 5 ft., each vat holding 240 tons and having 8 bottom-discharge doors. These vats form one solid row 700 ft. long with four car-tracks lengthwise



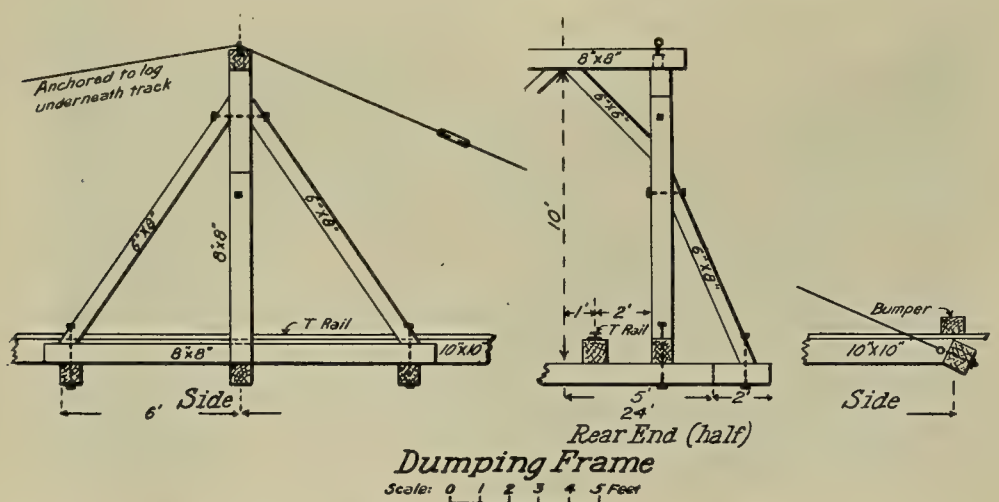
Dumping-Frame, Mercur, Utah.

underneath for disposal of tailing. This tailing is transferred, by contract, from vat to dump at a cost of about 8 cents per ton.

Seven laborers in gum boots, as the ore is exceptionally slimy and consequently wet, drag and pull, rather than shovel, the tailing into cars underneath, where one man is constantly employed 'spotting' the cars. Cars are of the side-wing dumping type known in mining camp parlance as the 'battleship' car, holding four tons each. Two trammers complete the crew of 10 men. Two 8-hour crews dispose of the daily capacity of four vats.

The filled car is pulled by a horse on a trot to the dump, where a movable platform is used to facilitate dumping operations. Arriving near the platform, the trammer (from his riding step at the front of the car) unhooks the single-tree and quickly turns the horse to the side of the track. The momentum of the car carries it onto the dumping-frame, and since the frame is set with an up-grade, the car starts back when the residue is out, the trammer gets hold of his horse, and is off again for the vat-room on a trot. The celerity and precision with which the whole operation is performed makes it an interesting one to watch.

The photograph and drawing will explain the dumping-frame and its use. In the illustration it will be seen that the sand has been dug away from the frame; plank and rollers have been placed underneath; it will now be 'barred out' as far as safe, the plank and rollers removed, the track connected, and the cables anchored to a log cross-wise underneath the track and 60 ft. back; then this track is ready for use. As the top of the dump is over 200 ft. above the ground, a large amount of dumping space is available. The frame is built of as heavy timber as is necessary to sustain five tons safely, but two experienced men find no difficulty in moving it forward into a new position. In the background the two trammers are indistinctly seen at their work. This frame has been used at all the other mills in the Mercur district with entire satisfaction.



Details of Dumping-Frame.

A remarkable airship flight is reported from Switzerland. A dirigible baloon manoeuvered over Lake Constance for 6¾ hours on June 29. The gas envelope is 445 ft. long, and has a diameter of 49½ ft. The ship carries three motors of 145 hp. each, which actually developed an average speed of 34½ miles per hour and a maximum of 38½. It caried 14 passengers, and without casting ballast attained a height of 1000 ft. Communication with the earth was maintained throughout the trip by wireless telegraph.

Verniers, of an engineer's transit, may be more accurately set at the zero mark if care be taken to have the lines on the scale coincide with those of the vernier, not only at the zero of the scale but also at both ends of the vernier.

GOLD MINING IN PORTO RICO.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM B. McKINLAY.

(*Continued From Page 98.*)

The first town on the island of San Juan was established by Ponce de León in 1509, and was called Caparra to signify the fact that the settlement of the island, as desired by the King, was definitely inaugurated, the word meaning a token or earnest. Caparra was situated on the north coast, so as to be near the mines which the Spaniards had commenced to work, but in an unhealthy marshy lowland across the bay from the present capital, which was established in 1520. The first gold of any consequence taken from Porto Rico was obtained by Ponce de León. He had it melted in Española, and it was made into a large chain. The records show that the chain was valued at 8975 pesos and 3 tomines, so that the royal tax would have been 1795 pesos and 7 granos. It arrived in Spain in August, 1509.

The following system of weights was used for weighing gold at the time of the conquest, and it still survives to some extent in parts of Spanish America:

TABLE 1.

ANCIENT SPANISH GOLD WEIGHTS.

Unit.	Origin of Name.	Meaning.	Equivalents.	Metric Equivalent Grams.	Value in U. S. Currency. Pure Gold.	Gold Bullion 885+Fine.
Grano	Latin	A grain	.....	0.0479	$0.031+	$0.027+
Tomin	Arabic	⅛ part	12 granos	0.575	0.38	0.325
Peso Castellano	Spanish	A weight of Castile	8 tomines	4.6	3.04	2.60
Marco	Anglo-Saxon	A unit	50 castellanos	230	152.11	130.00
Libra	Latin	Balance	2 marcos	460	304.22	260.00

The first melting of gold on the island of San Juan or Puerto Rico was done by order of Ponce de León on October 26, 1510, at Caparra; and the royalty of one-fifth amounted to 2645 pesos and 4 granos. The next was on May 22, 1511, on which the royal fifth amounted to 3043 pesos, 5 tomines and 6 granos. There was evidently another melting very soon after, for on August 7 Ponce sent 10,000 pesos to the King as the royal share of the gold mined up to that time.

On September 9, 1511, the King wrote to the officials in Seville, saying: "I am delighted to learn that 10,000 pesos of gold came from San Juan. I did not expect so large a yield as soon as this. It must be, as they say, that the mines are better than in Española." On the same day he wrote to the Admiral, telling him to favor Ponce as much as possible. Although the King wanted to have a model colony, it was not an easy matter to induce people to settle there. By royal decree one need only apply to the officials in Seville, and need not give further information, indicating that a criminal record in Spain would be no bar to a prospective colonist. In 1512 the gold output was not very large. A shipment of 6000 pesos was made early in January, 1513, and a shipment of 234 pesos and 4 tomines of unmelted gold was made at the same time, to show the people of Spain how the gold looked when taken out of the mines. This was also a royal fifth, so the total production for 1512 amounted to 31,171 pesos and 4 tomines.

In 1513 the King issued a set of ordinances which contained thirty-five excellent provisions, and many suggestions were made, not only for the good of the Indians, but for the general colonization of the island. As a result, special efforts were made to compel all bachelors to marry, to compel those colonists who were already married to send to Spain for their wives, and to provide for the allotment of Indians to the married men in preference to bachelors. The mining industry took on new life in this year, for on April 21, 1513, the first melting of gold in the new town of San German yielded 30,737 pesos and 3 granos, of which the King received the usual fifth. This was almost as large as the melting at Caparra, now called the city of San Juan, on August 1, which amounted to 36,875 pesos. They probably had one or more meltings at Caparra earlier in the year, for the officials at Seville received gold from San Juan on August 2, 1513, three boats bringing 16,057 pesos and 1 tomin as the King's fifth, the San German melting of April very likely being included in the shipment. In the year 1514 the official records show an apparent falling off in the gold production, but a letter written by the King to the Treasurer of the island sheds some light on the subject. Among other commands, he says: "As to the abuse of carrying off gold without having it melted, remedy it." This indicates the smuggling of gold away without paying the royal tax. In 1514 the melting at Caparra yielded 8482 pesos 4 tomines and 6 granos for the royal fifth, and the records show that in San German there were three meltings. Two meltings of placer gold, made in February and June, gave a total of 7243 pesos and 4 granos for the King's share; and in June a special melting of gold from 'nacimientos' yielded 2763 pesos, 6 tomines and 8 granos, of which the King received only a tenth part. This is the first record of gold mined from veins in the island of Porto Rico. The word vein is used for want of a better one. Nacimiento means the source or origin, and it is not reasonable to suppose that the Spaniards would have applied that name to placer deposits. It is probable that, in searching the smaller streams for pocket placer-deposits, some of the miners discovered outcroppings of gold-bearing rock in the beds of the streams. As the decomposed rock would have to be pounded to fragments to liberate the gold contained in it, the officials deemed it proper to exact a tax of only a tenth part, instead of the usual fifth as levied on placer gold.

Such deposits have been worked in Porto Rico in recent years with implements as crude as those employed in the sixteenth century. In 1900 the writer bought, from a vagrant native prospector, gold which showed none of the marks of placer gold. The native gave a very clear description of the nature of the deposit and of the antique methods by which he extracted the gold; but how rich and ex-

tensive that particular deposit is will not be known until he can be induced to sell the secret of its location, or until some other prospector runs across it. It is at the eastern end of the island, somewhere in the hills between the villages of Ceiba and Mameyes.

A violent storm, called ouracán or huracán by the natives, did considerable damage in the island

Valley Containing Auriferous Gravels, Porto Rico.

in the year 1515; and in the fall of the same year the caciques Humacao and Daguao started a revolt which lasted some time in the southeastern part of the island. Notwithstanding all these troubles, the gold output was quite large. The officials in Seville received several shipments of gold from the island, the royalties amounting to 23,492 pesos. Of this,

Scene on Military Road, Porto Rico, Near Ancient Gold-Diggings.

2000 pesos represented the one-tenth share of gold from nacimientos; the balance being the regular fifth from the placer product. In 1516 some of the indignant settlers drew up a set of recommendations and sent them to the King, in the hope that grafting officials might be punished, that favorites might be put out, and the unnecessary offices which had been created for them (such as mining notaries who exacted a special license-tax from each miner in addition to the legal royalty), might be abolished. The King died on February 23, of that year, and the communication must have found its way into the hands of Cardinal Jimenez de Cisneros, who had been appointed as regent of Spain for Prince Charles. If any definite action was taken on the petition, it does not seem to have improved conditions in the island to any great extent. On January 14, 1516, the officials reported that they had on hand 3000 pesos of gold which represented the King's royalty. They evidently sent that, with a little more, in the early spring; for the records in Spain show that 4000 pesos arrived there on April 19. Perhaps the news of the King's death made the officials fear a rigid inspection of the accounts, or it may have been in the ordinary course of business; but the records show that on July 21, 1516, a special melting was made of the 'King's own' gold, and the result of the melting was 108,752 pesos. A public melting at the same time, and another in October, gave a total royalty of 9160 pesos. The

royalties for 1517 amounted to at least 13,000 pesos and probably much more. Andrés Haro, the treasurer, wrote to King Charles in January, 1518, saying: "They have been melting in each of the three meltings in the last two years, 250,000 pesos in this city and in San German 186,000. But this varies." While this would indicate that the amounts as stated in Table 2 are entirely too low, the statement of Haro is not sufficiently definite to make it the basis of an estimate. In 1518, 25,497 pesos reached Spain as the King's royalty. In this year the priests of the order of San Gerónimo sent to the new king an urgent plea in behalf of the ill-treated Indians; saying: "They should be set free or at least excused from compulsory mine work, which is killing many. About a third have taken to the hills, where they are unassailable. They have killed many settlers, and it is unsafe to go among them. The best plan is a new allotment, giving the Indians to the respectable married men, and not over eighty to each. Mining should be abandoned in favor of cultivating the soil, and all Indians capable of self-government should be freed." Some of the priests thought that it would be unjust to free the Indians, on account of the loss to the owners, and recommended that if the Indians were freed each settler should be given one black slave in exchange for every five Indians taken away from him. About this time an epidemic of small-pox ravaged the island, and many natives died from this cause. The Spaniards suffered to some extent from this and other diseases, and the mortality among the children was very great, especially in Caparra. The moving of the capital, a question which had been discussed for several years, was definitely decided in July, 1519; and the sentiment of the majority was that the move be made at an early date, and that if Ponce de Leon did not care to move with them he could himself live in Caparra as long as he pleased.

Two shipments of gold were made in the year 1519, being of 10,000 pesos each; the second one reaching Spain in January of the following year. In 1520 there were five small shipments, aggregating only 15,734 pesos, and if the royal fifth did not exceed the amount of these shipments the total production for the year was only 78,670 pesos. Although the royalties from 1516 to 1520 have been taken as being a fifth of the production, it is probable that some of the gold came from the nacimientos and only paid a tax of one-tenth, and the figures of the total production should be somewhat increased; but in estimating these quantities only the lowest figures are taken, so that it will be impossible for exaggeration to creep in.

The decrease in the production was partly due to the moving of the capital. On November 16, 1520, Baltazár Castro wrote to the Emperor (as Charles the Fifth was now called), stating that the city of Puerto Rico had been transferred to an islet across the bay from the old location of Caparra. In 1520 almost a third of the yield came from some newly-discovered mines, probably in the vicinity of Luquillo, near the eastern extremity of the island. On account of the scarcity of Indians, due to their extermination and flight, slaves were obtained at great expense from the firms which had the exclusive right to import negroes. The officials recommended to the Emperor that as an inducement to continue mining under the new labor-conditions, the royal tax should be reduced from one-fifth to one-tenth. In the latter part of 1520 this was done.

As the tax on gold had been reduced to a tenth, the miners were encouraged to renewed activity; and the output reached 99,993 pesos and 6 tomines in 1521, and 189,790 pesos in 1522. From 1523 to 1529 the records are not very clear as to the production. Some historians estimate the royalties to have amounted to 40,000 pesos for the seven years. Keeping well within that limit, an estimate of the production as averaging 50,000 pesos per year is sufficiently conservative. On October 4, 1526, a severe hurricane occurred, and almost every house in the island was destroyed; the high water doing so much damage that many settlers lost pratically all their property. About two years later a French war vessel or privateer landed on the west coast of the island and sacked and burned the settlement of San German. The settlers became discouraged, and in 1529 the officials asked the Emperor to provide artillery for defense against pirates. They also asked that concessions, such as the free importation of negroes, be granted to encourage the miners; saying that only one mine was in operation. Although no concessions of importance were granted, except the extension of the one-tenth tax on gold, the miners took out 132,400 pesos in the beginning of the year 1530, the royalties reaching Spain in June and July. Then, in the middle of the summer, disaster came to the island in the shape of three violent hurricanes. These occurred on July 26 and August 22 and 31.

The hurricane of 1899, during which I experienced some thrilling adventures in aiding less fortunate victims, was but a summer storm in comparison with the successive hurricanes of 1530. Not only did the storms destroy their houses and crops, but there was no kindly government close by to rush supplies of beans, rice, spring bonnets, and silk petticoats to the suffering inhabitants. To make matters worse, there were two more hurricanes in September, and the Caribs came after fresh meat again; murdering many settlers and carrying away twenty or thirty Indians and black slaves. The inhabitants of the islands were so terrified that the women and children were afraid to sleep in the rude shelters which had been improvised, and took refuge in the churches and other stone buildings. Notwithstanding the condition of the island, mining was not abandoned, for in 1531 a total of at least 25,000 pesos of gold was taken out. In June, 1532, the officials wrote to the Empress to the effect that: "Up to this time, ordinarily everybody got gold in the rivers. Finding very little in these, after the hurricanes, the people have searched in the hills and they have found two or three veins from which comes very good gold. But these have been held by three or four who discovered them. The rest, on account of debts and lack of negroes, can not go prospecting, and they are lost. If you would

give general permission to bring slaves without having to buy at a high price, from those who have a government monopoly, they would get plenty of gold."

The production jumped to 90,000 pesos in 1532, and prospects began to look brighter. Early in 1533 one writer stated that the island was beginning to get populated again, and that every day new mines were being discovered, and also new veins of gold. Notwithstanding this optimistic view, the officials of the city wrote to the Empress on February 3, saying: "There are few people here; no Indians, and blacks are expensive. Let the people bring negro slaves, paying the export duty at this port." Again, in April, they wrote: "Everybody is in debt, on account of buying negroes on credit in the hope of getting gold, and then not getting it. Many are in jail, and others have fled to the woods, to escape their creditors." The officials sent 8000 pesos royalty in 1533, and only 6500 pesos in 1534; representing a production of ten times those amounts.

In 1535 only 5000 pesos were sent to Spain as the royal tenth. This increased to 10,000 pesos in 1536; and to 12,000 pesos in 1537. In 1536 Sedeño finished a lively campaign against the Caribs, and then started toward the South American coast. It is quite possible that a large part of the royal share of gold was expended in fitting out the expeditions against the Caribs, which would account for the small amount sent to Spain. In 1538 gold mining declined to such an extent that we may almost consider the industry abandoned from that date. The officials wrote in July of that year to the effect that several veins of silver-bearing lead ore had been discovered, stating that if the tax on all metals except gold was reduced to one-twentieth or to one-fifteenth, and the tax on gold continued at one-tenth for ten years, the search for veins would be continued. They further recommended that sugar planting be encouraged.

In January, 1539, the melting of the entire gold product for the preceding ten months yielded only 30,000 pesos. Some silver or lead ore was taken out of the veins which had been discovered; but after an unsuccessful attempt at smelting it they concluded to abandon that line of work until the arrival of an expert. It is doubtful whether any expert has ever made a thorough investigation of these lead deposits, which appear to be situated near the headwaters of the Rio de la Plata, and not far from the trail which joins the towns of Caguas and Patillas.

The island remained in a miserable state until about 1550, when the sugar industry began to be important. In 1552 the Contador, Luis Pérez de Lugo, wrote to the Emperor that because of the sugar mills very little gold was taken out. In 1554 the officials of the island repeated this assertion, adding that it would be well to order that each proprietor should put at least fifteen negroes to work in the mines. No definite record seems to have been kept of the gold production of the island from 1538 to the present day. Mining was carried on very irregularly, and it is probable that the payment of the royal tax was avoided whenever possible. A conservative estimate of the average annual production has been made by Manuel Victor Domenech, of Ponce, P. R., who places it at from 6000 to 8000 pesos per year. The existence of the placer deposits has been recognized by all the historians, though the great majority of comparatively recent writers have either absolutely ignored or have denied the fact that deposits of gold in veins were discovered, and that the Spaniards actually worked them until the news of Perú, Honduras, and other lands drew away the experienced miners; just as the news of the rich mines of California drew the miners from Georgia and the other Southern States which had up to 1848 produced the greater part of the gold mined in the United States.

TABLE 2.

GOLD PRODUCTION IN PORTO RICO, 1509–1538 INCLUSIVE.

Years.	Production, in Pesos.	Value in U. S. Currency.
1509-1513	207,308.50	$539,002.09
1514-1518	575,892.20	1,497,319.74
1519-1523	518,453.75	1,347,979.75
1524-1528	250,000.00	650,000.00
1529-1533	377,400.00	981,240.00
1534-1538	365,000.00	949,000.00
Totals	2,294,054.45	$5,964,541.58

In Table 2 is given a re-capitulation of the gold production of Porto Rico up to and including the year 1538, the total for the thirty years amounting to practically six million dollars.

The annual report of the Director of the United States Mint shows that the production of gold in the United States for the years from 1792 to 1848, inclusive, or from the establishment of the U. S. Mint until the discovery of the rich gold deposits of California, was $24,537,000; or an average annual production of only $438,160 as against an average annual production of $198,818 for thirty years of sixteenth century mining in the little island of Porto Rico.

Determination of nickel in ores, according to Pozzi-Escot, may be made with accuracy by the following method, even when Co, Fe, or Mn are present. In a solution of the ore alkaline-earth metals are first separated by use of $(NH_4)_2SO_4$ solution. The filtrate is then concentrated, and to it is added a large excess of $(NH_4)_2MoO_4$ in saturated solution, and also some NH_4Cl. The mixture is heated to 80 or 90°C. for some minutes, then stirred frequently for an hour until cold, the cooling being preferably effected by use of ice. All of the Ni is thus precipitated as nickel ammonium molybdate together with most of the iron. Filter, wash with NH_4Cl (saturated solution) and separate Fe by NH_4Cl with NH_4OH. In the filtrate the Ni can be separated for weighing by any one of many known processes. Grossmann and Schuck assert that the reaction (which is not new) does not cleanly separate Ni from Co, some insoluble compounds of Co being always formed. Hence it is inapplicable as a test for Ni in Co salts, or in presence of that element.

MILLING AND CYANIDE PRACTICE, SAN PROSPERO MILL, GUANAJUATO.

Written for the MINING AND SCIENTIFIC PRESS
By J. S. BUTLER.

The San Prospero mill belonging to the Mexican Milling & Transportation Co., is situated on the outskirts of the City of Guanajuato, Mexico. The mill was built for the purpose of treating custom ores and has been in operation since November, 1906. During this period it has milled and treated the ores from various deposits within the immediate neighborhood of Guanajuato. The results obtained formed the basis of operation for the San Prospero mill and may be taken as an example of the treatment of silver ore in this part of the country. The mill is constructed on a hillside having an average slope of 24°. The ore after entering the bins at the top of the mill is not again handled by physical labor or returned for treatment in any particular. The motive power is entirely electric, being furnished at 15,000 volts, alternating current, and transformed to 440 volts for the motors.

A 275-ton storage bin, 90 ft. behind the mill proper, feeds by gravity to a No. 3 McCully crusher. This discharges onto a 16-in. Robins belt, which moves across the sample-patio to a cross-belt above the battery ore-bins. These bins have a capacity of 375 tons and are filled by means of a Robins automatic distributor. Each conveyor-belt is operated by a 3-hp. Westinghouse motor, and the ore is fed to the batteries by Davis automatic feeders. The stamp-mill consists of forty 1050-lb. stamps, dropping 7 in., 102 times per minute. The stamp-guides are of the El Oro solid pattern. The cam-shafts are the Blanton pattern, the bearings being turned to receive the shaft, thus eliminating the necessity for babbit-metal. The mortars weigh 7500 lb. each, and are anchored to concrete foundations with 1¾-in. anchor-bolts. The battery-timbers are of Oregon pine and are bolted to cast-iron shoes, which in turn are anchored to the mortar blocks. The battery-timbers are also attached to the sills of the ore-bin, allowing the weight of the ore to aid in steadying the battery-frame. Tyler crimped-wire slot-screens are used in the batteries. The stamps are in units of 20, each being driven by a 50-hp. motor. No amalgamation is done, the pulp flowing directly to the concentration plant.

The concentrating plant consists of four classifiers, eight No. 3 Wilfley tables, sixteen cement-tables, and one vanner. The cement-tables were introduced by J. B. Empson, his idea being to procure a cheap efficient means of separating very fine sulphide, which it was found impossible to detain on the Wilfley tables. These cement-tables are 4½ ft. wide by 27 ft. long, with a pitch of ⅛ in. per foot. A thin layer of concrete is laid on a wooden platform, and a layer of cement placed above this. The cement is scratched, before setting, to form riffles. This table has proven more satisfactory than canvas, and much cheaper.

The overflow from the cement-tables goes directly to the slime plant, while the sand and concentrate retained are washed into collecting-boxes, and cleaned on the vanner. The sand tailing from the Wilfleys are conducted to the thickening cones at the head of the tube-mill. There are two of these cones 30 in. diam. and 36 in. deep, in which the pulp is thickened to three parts water to two parts sand. The tube-mill is 14 ft. long by 5 ft. diam. It is driven at a speed of 29 revolutions per minute by a 35-hp. motor, lumps of hard ore being used for grinding instead of pebbles. From the tube-mill the pulp flows to the separators 8 ft. diam. by 8 ft. deep, supplemented by four small cones, the underflow going to the sand-collecting vats, and the overflow to the slime-plant.

The sand-plant consists of two steel sand collecting-vats 26 ft. diam. by 6 ft. deep, and six leaching vats of the same dimensions. A Blaisdell distributor is used to fill the collecting-vats, the slime being drained off through a central slot-box overflow, and pumped back to the separating cones. A Blaisdell excavator and Robins belt system is used for charging and discharging the sand-vats. In connection with the plant there are two storage-vats of 90 tons capacity each, situated 15 ft. above, for the strong and weak cyanide solutions used in sand treatment.

The slime-plant consists of two steel slime-thickeners 26 ft. diam. by 12 ft. deep, six slime-treatment vats of the same size, three masonry collecting-vats, and the installation of a 60-frame Butters filter for the washing and thickening of slime-pulp.

The slime-thickeners are above the treatment-vats and are discharged by means of goose-necks into a launder running the length of the slime-plant. The pulp in the treatment-vats is agitated by revolving arms through which air is continually blown. The arms are driven by a worm-gear at three revolutions in each two minutes. The pulp is further agitated by 6-in. centrifugal pumps, one being installed for each two vats. The three masonry-vats mentioned above are used to retain slime, wash water for the press, and to receive the slime left in the press after the cake is made. The weak solution from the vat above the sand-plant is used for slime washes as well as sand-washing after treatment. Above the zinc boxes are two sand-filters for clarifying the weak solution, and a storage-vat for strong solution. Each vat feeds to the boxes in the zinc room, the tailings being run to separate storage-vats outside. The precipitation boxes each contain five compartments, 36 by 36 by 36 in., with angular bottoms, the screens being 6 in. from the bottom, allowing 30 in. space for zinc. Two-inch underflow valves connecting with a launder carry the precipitate to the sump. From there a Snow pump delivers to a Schrive filter-press above the boxes, so that the drainings flow to the head of the zinc-boxes, avoiding any chance of loss. There are four melting furnaces fitted to receive a No. 300 graphite crucible.

The pump-room contains two tailing solution sump-vats, one for strong and one for weak solution, and one mill-supply vat which receives the overflow from the slime-thickeners and as much strong or weak tailing-solution as may be necessary. Two Aldrich triplex pumps 8 by 9 in. deliver from the mill-supply

sump-vat to the mill-supply vat at the head of the mill through a 7-in. pipe. The weak solution is returned by a 7 by 9 in. pump and the strong solution by a 5 by 5 in. triplex-pump, both in duplicate. Fresh water is pumped from the dam below the mill for use in washing the charges, no water being used for other purposes.

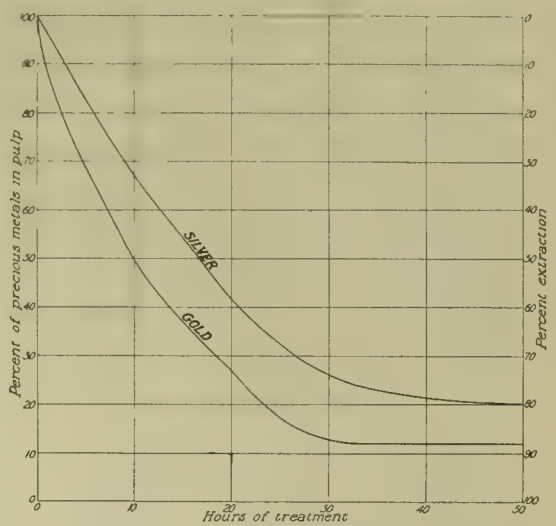
For some months the system of crushing in cyanide solution has been tested, the results proving most satisfactory. The solution in the mill-supply vat, with a capacity of 354 tons, is kept at 0.12% KCy. This solution is used throughout the mill, fresh water being added only for the last washes on the sand and slime. Ore is delivered to the batteries at 1¼-in. size, with 4 gal. of solution per minute per stamp, and is crushed through 30 mesh with a stamp duty of 3.7 tons per 24 hours. The pulp from each 10 stamps passes to a de-watering cone, the slime flowing to the cement-tables and the sand to two Wilfley concentrators. The Wilfley tables concentrate 230 into 1 with an extraction of approximately 24% of the silver and gold fed to the batteries. The slime tailing flows to the cement-tables and the sand to the thickening cones above the tube-mill. The cement-tables are sluiced down at intervals, the concentrate, containing some sand, being collected and cleaned on a vanner, the tailing being returned to the sand-classifiers. These tables concentrate 2600 into 1 with an approximate extraction of 3% of the precious metal fed to the batteries, the tailing flowing directly to the slime-plant. The sand pulp is thickened to 60% moisture, and re-ground in the tube-mill, and with the overflow passes to the double set of cone-classifiers. The overflow goes to the slime plant, and the underflow to the sand-collectors.

The sand after being drained thoroughly in the receivers is charged 'dry,' that is, de-watered, into the treatment-vats. Here 30 washes of strong solution of 0.32% KCy are applied, followed by 20 washes of weak solution of 0.15% KCy, and 5 washes of clear water. Each wash of 10 tons of solution requires from 3½ to 4 hours to pass through the charge. The sand is automatically discharged after the last wash.

The sand shows the following on screen-analysis:

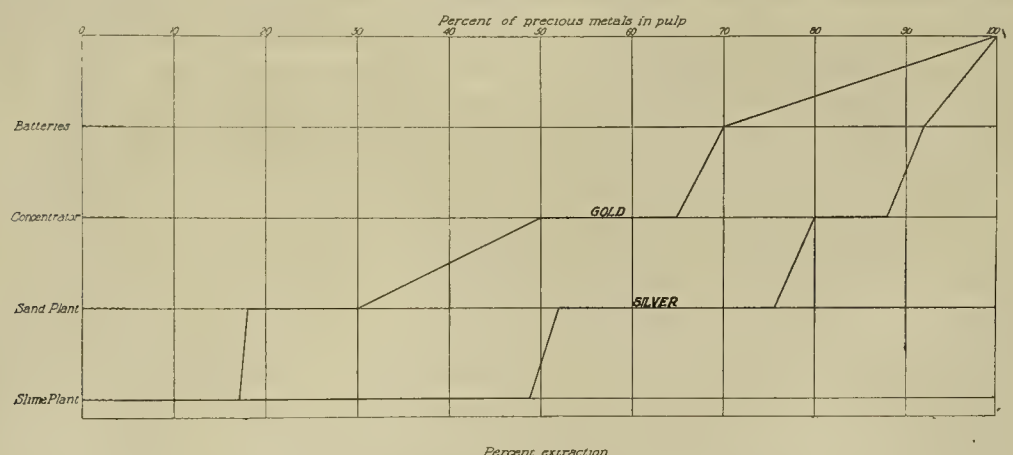
On	40 mesh	3	% by weight
"	60 "	37	" " "
"	100 "	21	" " "
"	150 "	23	" " "
"	200 "	6	" " "
Through	200 "	10	" " "

Averages on the same charges show that approximately 70% of the extraction is made from the sizes through 40 and on 100 mesh, the extraction of the material held on 150 mesh being slightly lower, and of that on 40 mesh, on 200, and through 200 mesh being quite low.



Solubility-Curves. Slime Treatment, San Prospero Mill.

The slime flows to the thickeners above the slime plant and is delivered with 70% moisture through a launder to the treatment vats. Here the charge of weak solution is brought up to 0.15% KCy, and the agitation continued for 12 hours. The charge is then settled and 30 in. of solution decanted to the sand-filter. This is followed by five washes, the agitation lasting six hours for the first and four hours for each of the remaining washes. Finally the charge is drawn into the masonry vats, above the



Curves Showing Extraction Due to Crushing in Solution, San Prospero Mill.

Butters filter, with fresh water. The rate of extraction in the slime-plant is shown by the accompanying curves plotted from results obtained during two months' run.

The slime-pulp, with the last wash of clear water, is drawn from the masonry vat through the filter-press, the solution flowing to a sump. The cake is formed in 40 minutes, after which time the remaining slime is returned to the masonry vat and the cakes washed with clear water for 30 minutes. The wash-water is returned to the supply tank to be used again, until it contains sufficient metal in solution to be sent to the zinc-room. The cakes are finally discharged with fresh water. From 20 to 22 in. vacuum is used on the press, and the cake formed is from 0.6 to 1 in. thick. The filter-leaves are soaked for five hours in a 1 to 1.5% acid-bath, before being set. The cycle of operation of the filter for five tons of slime is as follows:

Filling	5	minutes
Making cake	40	"
Returning slime	15	"
Filling with water	5	"
Washing	30	"
Returning waste water	15	"
Discharging	10	"
Total	2	hours
Thickness of cake	0.6	in.
Tons per charge	5	

The strong solution from the first washes of the sand flows to the supply-vat at the head of the zinc-boxes, while the weak solution from sand, slime, and filter-press is run to a sand-filter on the same level. The zinc-boxes are fed from these supplies, the solutions going through separate boxes and the tailing flowing into the separate vats in the pump-room. The flow of the weak solution is regulated to 5 or 6 tons per hour and the strong solution to 2½ tons per hour. Clean-ups are made every 10 days, the zinc-shaving being thoroughly washed and transferred. When all the precipitate is sluiced to the sump it is pumped through the Schrive press, and the cake is thoroughly dried with hot air. It is then fluxed and charged 'loose' into the crucibles.

The sodium-cyanide is added in the sump-vats, and the strength of the weak solution and the mill solution regulated by pumping from the common supply. An absolute regulation is obtained by this method. The consumption of cyanide for the past three months has been 0.8 kg. per ton of ore milled, and the zinc used 0.37 kg. per ton. A small amount of lead acetate, 0.07 kg. per ton, is supplied to keep the solution from fouling. A curve is added showing the percentage of extraction throughout the mill, due to the new system of crushing in cyanide solution.

By an examination of this sketch, it will be seen that the extraction of metals in the mill before the pulp reaches the cyanide plant is as follows:

	Au %	Ag %
In the batteries	31.2	4.8
Between batteries and concentrators	5.4	5.6
Between concentrators and sand plant	21.0	5.0
Total mill extraction	57.6	15.4

MINERAL WEALTH OF NORTHEASTERN OKLAHOMA.

The demand for information concerning this new State has resulted in the publication of data by the U. S. Geological Survey in Bulletin 340, which forms Part I of 'Contributions to Economic Geology, 1907.' The area covered by this report is a strip extending 83 miles in an east-west direction and 104 miles from north to south, including the northeastern part of the Creek Nation, practically the whole of the Cherokee Nation, and all of the Seneca, Wyandotte, Ottawa, Shawnee, Modoc, Peoria, and Quapaw reservations.

The lead and zinc deposits now known occur only in the northeastern part of the area covered by the report, and the districts where mining has been carried on, or where the indications have encouraged extensive prospecting, are described in chronologic order. Areas that have yielded oil and gas are briefly discussed and are outlined on the geologic map. The most productive areas are the Alluwe-Coodys Bluff or 'shallow sand' field, the Bartlesville or 'deep sand' field, and the Glenn 'pool,' near Kiefer. Smaller pools lie between the Bartlesville and Glenn fields, in line with them, at intervals so close as practically to constitute a continuous field from Kiefer to the Kansas line. New but promising areas are the Delaware, Hogshooter, and Morris-Baldhill fields. Most of the coal beds of the district are thin and not of great extent, but several have been worked to supply a market that is more than purely local. The rock formations of this portion of the State include an alternating series of limestones and sandstones, with intervening shale, the whole dipping gently north of west. As the limestones and sandstones are harder than the shale, and thus offer more resistance to weathering, they tend to form long gentle westward slopes, with steeper eastern slopes of shale, the harder rock coming to the surface along the crest of the ridge. Where the limestone has been protected from weathering by a thin covering of shale the essential materials for cement are found in favorable relationships. Where, in addition, adequate supplies of fuel, especially natural gas, and good transportation facilities are available, the climax of advantageous position for cement manufactories has been reached. The area is well supplied with building stones: limestone, sandstone, and granite. Rock suitable for supplying small local demands can be found almost anywhere within a mile or so of the place where wanted. Surface clays are suitable for the manufacture of common brick, and shales that are adapted for making vitrified brick are also abundant.

Phosphate deposits are always bedded, and so may be located as placer claims, under the same conception as limestone or shale for cement-making. In neither case is the rock to be considered in the light of structural material, which was the intent of the law in its reference to locations of stone for quarrying. The material is required for what it will yield as a chemical substance in the manufacture of commercial fertilizer.

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Editorial.

WHEN LABOR UNIONS co-operate with employers in scientific enquiries tending to determine conditions of mining practice which shall simultaneously promote safety and economy, one may begin to look forward to a time when these associations shall prove an important aid in doing the world's work more efficiently and honestly. There would seem to be no valid reason why the labor union should not be a welcome assistant to the capitalist, while promoting those aims which are professedly at the bottom of all such organizations—enhancement of the dignity and rewards of labor. The concrete case inspiring this brief homily is the appointment of a powder commission in the State of Illinois to settle all disputes relating to the use of powder underground, including the investigation of shot-firing devices, the making and grading of powder, and many technical questions relating to safety and efficiency in coal mines. On this commission the labor union has equal representation with the operators. In Indiana recently 52 members of a miners' union were expelled for bringing action in the matter of a fine assessed against them for causing a 'stampede strike,' and the union as an organization paid the fine which was levied under the terms of the contract. Evidently the age of reason is dawning in the Mississippi valley.

Harmony and Good Sense at Goldfield.

A NOTABLE illustration of the superiority of common sense over obstinate determination to get the 'pound of flesh' nominated in the bond, is furnished by the agreement reached between the litigants in the celebrated case involving the Goldfield Consolidated Company and the Jumbo Extension, at Goldfield, Nevada. Owing partly to the complex mineralization, and party to the inherent difficulties of the so-called 'law of the apex,' it was evident that the proceeds of the mines would be wasted in an endless legal contest unless technicalities were brushed aside and the questions at issue settled by a practical adjustment in the light of geological peculiarities not provided for in the existing statutes. The compromise is likely to exert a far-reaching influence, lessening the esteem as an essential feature of a mining claim in which the extra-lateral right has been widely held. The principle of restriction of proprietary rights to a vein within the vertical side-lines of the claims has been accepted as a controlling factor in the agreement reached, and yet, as usually happens in the making of compromises, some inconsistencies are embodied in it. The lode in the Mohawk dips toward the east, and the Wedge fractional claim, lying adjacent on that side, is deeded to the Goldfield Consolidated; this

company owns the next two claims, which are adjoined by the Polverde, belonging to the Jumbo Extension Company. The right to that portion of the vein lying within the vertical side-lines of the Polverde is conceded to its locators, but the Goldfield Consolidated will mine and treat the ore on joint-account, and no extra-lateral rights are acknowledged beyond the east side-line of the Polverde.

A simple vertical side-line agreement has been likewise reached between the Goldfield Consolidated and the Combination Fraction, as far as relates to that claim. In this instance the right to the continuation of the vein on the dip eastward from the Combination Fraction remains vested in the Goldfield Consolidated through its ownership of the adjoining Jumbo claim. In the case of the Vinegorone fraction, the same arrangement applies as in that of the Polverde, except that the rights of the Goldfield Consolidated are recognized as becoming re-established on the vein where it dips beyond the Vinegorone side-line into the Laguna claim. The extra-lateral principle, as laid down by the law of 1872, is here widely departed from for the sake of settling present difficulties, but the effect of the provisions for extravagation under extra-lateral rights as finally interpreted by the courts, gives rise to the interesting question of what right there might be to follow the vein indefinitely on the dip beyond the most easterly side-line of the Goldfield Consolidated property, since no apex exists on the claim where the right becomes re-established. Such a dispute might be adjusted by a further application of the commonsense principle which prevailed in this happy settlement of difficulties. The example set will undoubtedly be followed elsewhere, and the establishment of such precedents may easily blaze the way for modifications in the Federal statutes relating to mines. An agreement out of court also accepting the vertical side-line limitation has terminated the contest between the West End Consolidated and the McNamara Mining companies at Tonopah. A spirit of good-will seems to bubble up freely as soon as definite boundaries to property are substituted for the uncertain meanderings of titular rights into a neighbor's domain.

Mexican Mining Law.

IT is our privilege to present in another column a clear explanation of the scope and aim of the proposed revision of the Mexican mining statutes, communicated to us by the author of the measure, Mr. Olegario Molina, Secretary of Fomento of the Republic of Mexico. This statement is one which should allay the apprehensions of capitalists financially interested south of the Rio Grande, and should encourage those contemplating investment in enterprises based upon utilization of the natural resources of our sister republic to repose greater confidence in the Government than would be possible were it careless of the ordinary safeguards adopted by the leading nations of the world. The excessive liberality of the Mexican Government in regard to legislation favoring foreign capital and in the bestowal of concessions and special privileges has been criticised perhaps more severely by those outside of the Republic than by its own citizens. Tendencies in the past were distinctly toward favoritism, involving the evils inherent in a system admitting of discrimination. Foreign companies could plead special consideration of rights based upon powers conferred by law in the country of their origin. The machinery of the diplomatic service has been repeatedly called into operation to adjust difficulties of a private character that would have been settled by ordinary judicial process except for the complications arising out of the peculiar status of alien corporations.

Special inducements were needed to allure capital from abroad after decades of romantic and highly uneconomic political vicissitudes. The construction of a great self-conscious, self-respecting nation out of multitudinous warring factions was a cyclopean task. Few men in any country or any age could have done it in thirty years. No advantages of politico-geographic position were available for President Diaz whereby he could turn mutual jealousies of neighboring powers to account in forwarding his schemes of national aggrandizement. Mexico was isolated, touching the United States along what was, until recent years, a wild frontier of sparsely-peopled desert, with turbulent petty states to the south, and bounded east and west by long stretches of ocean. The resources of the country were imperfectly known, while stable governmental authority was believed impossible. Under such circumstances the invitation to foreign capital required the offer of advantages commensurate with the apparent risk involved. Among these were provisions of law admitting foreign corporations under terms which meant practical recognition of the right of appeal to diplomatic intervention for the settlement of a large class of difficulties. Such a condition necessarily leads to complications and unequal justice. Mexico has progressed to a point where, in the opinion of her statesmen, she may presume to adopt the regulations prevalent in other self-reliant countries. It is natural that such manifestations of an independent spirit should meet with disapproval by those who had come to consider extraordinary privileges as an inalienable right. The effort to attribute the proposed changes in the mining law to a spirit of animosity toward the foreigner is manifestly without warrant. The Mexican has borne the humiliation of the war of 1848 with a grace worthy of profound admiration, and while some lingering distaste for the American may find occasional expression by hot-heads, the sincerely cordial feeling of the people and the Government has been confirmed in too many ways to be distrusted. Such clamor is discreditable to those who make it. The facts do not sustain the criticism.

An examination of the provisions of the new articles in the project of law drawn up by Mr. Molina discloses no attempt at embarrassing foreign capital in the Republic. The law cannot be made retroactive, so that vested interests will remain undisturbed. There is no restriction upon the organization of companies by foreigners under the laws of

Mexico. It is not even required that any of the incorporators or directors shall be residents of the Republic. The corporation act of Australia requires representation on the governing board by citizens of the Commonwealth, and similar requirements are made in many countries. Residence of incorporators is obligatory in California, and in many of the States of the Union. The Mexican regulation would preclude ownership of mining property by foreign corporations, and so do the statutes of the United States. If we have set an example of this kind, we cannot consisently complain if our neighbor accepts it as representing wisdom worthy of emulation. The new system creates a responsible owner amenable to the laws of Mexico. This, after all, makes for security to the foreigner. At present an alien corporation must be represented by an individual with absolute power of attorney. The degree of authority required in this instrument is so complete that the agent may involve his principals in transactions of the most damaging nature, and yet be held unaccountable in law for his acts. That such powers have so seldom been abused is a compliment to the integrity of the great body of men holding responsibility for the vast mining operations conducted by foreign companies in Mexico. Nevertheless the danger is there, and this would be eliminated if the new regulations were established. A limited power of attorney would then suffice for the representative in charge of actual work.

The right of an alien, as an individual, to locate and obtain patent to mining property, is not impugned, except that permission in the border States must be obtained. Here again Mexico exceeds the United States in liberality. By our Federal statutes, as determined by many court decisions, a proceeding to obtain patent to a mining claim is in the nature of 'inquest of office,' and citizenship is a necessary and material fact to be alleged and proved.

As pointed out by Mr. Molina, a foreign corporation may lease the property of a Mexican company. It may also own the entire capital stock of the Mexican company. This removes all restriction save that of remaining amenable to Mexican legislation. Herein lies revealed a purpose of the contemplated revision of law, which seems to have been generally overlooked. The Mexican Government has regarded with concern the tendency to combinations in restraint of competition which has been so pronounced in the United States. The efforts at consolidation of railway interests which have been thwarted by acts of President Diaz are interesting matters of recent history. It is evident that the future of the mining and metallurgical industries in the Republic is to be guarded likewise, in the interest of independent operators. The prevention of monopoly will undoubtedly secure a fair field for individual effort and will promote a healthy development of the country's resources. In this view the determination of the Government of Mexico to retain power to control the activities of future capitalistic undertakings is rational and commendable, and must work to the ultimate advantage of the great majority of investors.

OFFICIAL STATEMENT CONCERNING THE PROJECTED REVISION OF MEXICAN MINING LAW.

CORRESPONDENCIA PARTICULAR
DEL SECRETARIO DE FOMENTO.

MEXICO, D. F., July 20, 1908.

Editors MINING AND SCIENTIFIC PRESS,
San Francisco, Cal.:

Sirs—Referring to your kind favor of June 29, I take pleasure in giving you the information you desire regarding the clauses governing foreign rights as embodied in the proposal for the new mining law for the United States of Mexico, and which has been of late under discussion in the press.

The project contains two fundamental rulings on the matter as follows: the first establishes as a condition for permitting foreigners to acquire mining properties in the frontier States and Territories, that they shall previously obtain the permission of the Government of the Republic; while the second prohibits absolutely all foreign companies to acquire mining properties in any portion of Mexican territory.

The first ruling is not an innovation in the laws of the Republic, for there is extant the law of 1856, which exacts as a vital requirement the permission of the Government of the Union, in order that foreigners may acquire landed properties of any kind whatsoever, in any zone within twenty leagues parallel to the frontier line with any foreign country. The steady application of this law has not in practice presented the slightest objection, and all foreigners who wish to take possession of properties in the said zone, apply to the Federal Government for the necessary permission, which is never denied them whenever it appears from the report of the higher State or Territorial authorities that the applicant is in good standing and worthy of confidence.

By the new ruling in the project for the new mining law, it is proposed to make applicable to all the States and frontier Territories, but making mining properties only subject thereto, the said condition or restriction established by the law of 1856.

It is not difficult to justify the reason for said ruling if we consider that in the greater part of the frontier States of the Mexican Republic, the prospect of rapidly acquired riches through mine development, attract large numbers of persons of adventurous spirit and questionable character, such as always infest the frontier lines between two countries. It is imperative that the authorities should exercise due supervision over this class of persons, who frequently incite to conflicts and grave international complications, owing solely to their utter lack of principle; and of such, unfortunately, we have not a few examples in this country. For these reasons, therefore, it is, in my opinion, necessary to extend the zone within which foreigners may acquire mining properties, only after having secured from the Government permission for the purpose, which only means that foreigners must merely show cause that they are reputable persons capable of acquiring

mining properties without becoming a source of trouble to the State.

If we compare the condition just referred to with the Federal laws which obtain in the United States, and which exact either citizenship or at least the explicit purpose to secure the same in order to allow a private party to become owner of a mining property within the nation's territory, we must conclude that the new project cannot be accused, in this respect, of illiberality and undue restriction.

The existence of all companies, whether commercial, mining, industrial, etc., in every nation, really takes root from a legal conception. Said companies cannot possibly exist if the law does not authorize their creation, and unless the law-giver by whose permission said companies come into being, does also affix the limits of their activities. It may surely be affirmed that in these respects all the laws of civilized nations are in accord.

Granting, therefore, the preceding principle, the legislator of any given country is simply exercising an axiomatic right in not permitting ownership of landed properties within the State's jurisdiction, to such companies, corporations, or moral entities which owe their existence to the act of a foreign legislator, and whose rights and faculties depend upon the will of said legislator. The laws of Mexico, in accordance with those of many other countries, establish that the capacity of parties to own landed properties within Mexican territory is governed by the laws of Mexico, regardless of the nationality of the individuals in question. Therefore it is but an application of said principle to exact that all companies, or corporations, shall be organized in accordance with the laws of Mexico before they shall be empowered to acquire ownership within the Republic.

Therefore the right of the Mexican legislator to establish the restriction aforesaid would seem to be indisputable, as is also, in my opinion, the expediency of the measure. It is obvious that the Mexican authorities can on many occasions be confronted with serious obstacles to the proper enforcement of the laws, even in matters pertaining to territories within their jurisdiction, whenever the owner of the said lands shall escape all application of the law due to his owing his legal existence to foreign laws over which the Mexican authorities possess no supervision whatever. Let us take, for example, the formation of a 'trust' of the foreign corporations owning mining properties in Mexico. If for political or economical reasons it became necessary to the national interests to limit the abuses, or restrict the methods of said 'trust,' the Mexican authorities would encounter serious obstacles to the carrying into effect of remedial measures necessary to the nation's welfare, owing to the fact that the companies forming the 'trust' would be beyond the jurisdiction of the laws of Mexico. Whereas, if the said companies should be organized under the laws of Mexico, the legislator, the Government, and the Courts of this Nation would be enabled to exercise their legitimate functions, restraining or preventing any abuse of the powers possessed by enormous consolidations of capital, such as are constantly disturbing public feeling in the United States, and occasioning serious harm to numberless worthy and legitimate enterprises which would be powerless to defend themselves against such ruthless and omnipotent competitors.

Otherwise foreign capital, even with the restriction referred to, will be at liberty to invest in Mexico, subscribing to the shares of companies organized under the laws of Mexico. The prohibition merely applies to the acquisition of mining properties by foreign corporations, but in no sense to the investment of foreign capital in mining companies organized under the laws of Mexico. Neither is it forbidden to individuals of foreign nationality or citizenship to organize in Mexico mining companies, as these would be Mexican, being organized in accordance with Mexican law, even though all the individuals forming the company or owning shares therein, should be foreign. Neither should we lose sight of the fact that the citizenship of the foreigners comprising the said companies would be preserved inviolate, however important might be their interest in Mexican companies.

Finally, foreign companies shall always be empowered to work mines in Mexico, under lease or other arrangement, which does not entail the transference of ownership. This practice is constantly resorted to in the working of properties within the twenty-league frontier zone, because in virtue of the interpretation which has been given to the law of 1856, aforesaid, no foreign company can acquire ownership of mining or real estate within the said prescribed zone. Nevertheless, within said zone, and on the frontier with the United States, there have been developed with exclusively foreign capital, mining claims of great importance, which have not found the restrictions mentioned any hindrance to their successful operation, and which are worked by companies organized under Mexican laws.

It is understood that foreign companies at present working mines in Mexico shall not be deprived of the rights under which they have been operating. As in the case of the American Constitution, that of the Mexican Republic contains a clause which forbids any law from taking effect retroactively. Consequently, foreign companies owning mines shall continue to own them, though for the future they would lose the right of acquisition.

It would seem in order to add that the Mexican Government is greatly desirous of encouraging the investment of foreign capital in the Republic. The Government recognizes that to foreign capital is due a large share of the present national prosperity. Yet I, personally, as also many other persons of standing in the Nation, believe that it is most essential to the general welfare to exercise some supervision over the said capital, and this is the object of the project of law which I have here analyzed. The allegation that the Mexican Government is not well disposed towards foreign capital is utterly false, and contradicted by the policy pursued by the actual Government for many years. As for what concerns me, personally, I would add that I have followed, in the Department of National Development, the precedents established by my predecessors. I am glad to grant all facilities and information to foreigners that may enable them to effectively transact their business, provided, of course, that their purposes be serious, and their methods consistent with law and morality.

Faithfully yours,

O. Molina.

Personal.

ALBERT BURCH has returned from Placer county.

ROBERT LINTON, of New York, is in Los Angeles.

ROGER C. KNOX was in San Francisco from Tonopah.

EDWARD K. JUDD is examining mines near Silverton, Colorado.

DOUGLAS WATERMAN has returned to San Francisco from Antofagasta, Chile.

MARK B. KERR has returned from Tonopah and will make his headquarters in the Mills Building.

J. H. FENNESSEY, president of the Mine & Smelter Supply Co., has returned to New York from Denver.

H. S. KENNEY is now metallurgist to the Penhalonga Proprietary Mines, Ltd., Rhodesia, South Africa.

JOS. C. ERMAN, of Los Angeles, was in San Francisco on his way to examine mining property in Plumas county, California.

WILLIAM A. POMEROY has been appointed general manager for the Lustre Mining & Smelting Company, at Santa Maria del Oro, Durango, Mexico.

S. E. BRETHERTON, of the Bretherton Metallurgical Co., has gone to Redding, California, in the interest of the Redding, Afterthought & Northeastern railway.

H. C. CUTLER, chief engineer and acting manager for all of the Nixon & Wingfield holdings, is making a tour of inspection of all the company's possessions in Nevada and eastern California.

HORACE V. WINCHELL has resigned as chief geologist of the Great Northern Railway Co., to enter into general practice as consulting mining geologist, with offices at Minneapolis, Minnesota.

CORTLANDT E. PALMER has been made general manager of the Guanajuato Development Co., Guanajuato, Mexico, and associated concerns. He will also act as consulting engineer for the Esperanza Mining Co. in El Oro district, Mexico.

Obituary.

FREDERICK S. HARRIS died at San Diego, California, on July 17, after a siege of 18 weeks with typhoid fever. At the time of his death Mr. Harris was manager for the Kansas City-Goldfield Mining Co., at Goldfield, Nevada. Previous to that he had been associated with mining enterprises in the San Juan region of Colorado and in Mexico. He represented both W. C. Andrews and W. G. Carroll & Co. as mining engineer for many of their enterprises in Mexico and Central America. He was born in Chicago, October 22, 1859, and maintained an office in that city to the time of his death.

ANICETO GARCIA MENOCAL, long in the public eye as the chief engineer of the Nicaragua Canal, one of the most brilliant of America's civil engineers, died July 20 in New York. Mr. Menocal, the son of Gabriel Menocal, a Cuban planter, was born in Havana, September 1, 1839. He came to the United States in 1857 and five years later graduated from the Renssellaer Polytechnic Institute, at Troy, N. Y. On receiving his degree as civil engineer, Mr. Menocal returned to his native city, where, in 1863, he was made assistant chief engineer of the Havana water works. His work attracted attention, and in 1870 he accepted an offer as engineer in the Department of Public Works of New York City. He stayed there two years and left to become chief engineer in the Navy Department. In the service of the Government he attained distinction. He acted as chief engineer on all the surveys for establishing the practicability of a ship canal at Panama and Nicaragua, was chief engineer of the Maritime Canal Co., of Nicaragua, and in 1887 prepared plans and estimates of cost for a ship canal through Nicaragua. Mr. Menocal was sent to Paris by President Hayes as a delegate to the Canal Congress in 1879. For his work there he was made chevalier of the Legion of Honor by President Grévy.

Latest Market Reports.

LOCAL METAL PRICES—July 30.

Antimony	12@16c	Quicksilver (flask)	$45@46.50
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.85@ 5.80c	Tin	32@33¼c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
July 24	12.75	4.47	4.47	52⅜
" 25	12.81	4.47	4.53	52½
" 26	Sunday.	No market.		
" 27	12.81	4.47	4.53	52⅜
" 28	12.87	4.49	4.56	52½
" 29	12.94	4.49	4.60	52⅝
" 30	13.00	4.50	4.65	52¾

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 23. £. s. d.	July 30. £. s. d.	
Camp Bird	0 13 0	0 13 0	
El Oro	1 3 0	1 6 3	
Esperanza	1 12 6	3 0 13	ex div.
Dolores	1 10 0	1 10 0	
Oroville Dredging	0 9 6	0 9 0	
Stratton's Independence	0 0 9	0 0 7½	
Tomboy	1 2 6	1 3 0	

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. July 16.	July 30.
Amalgamated Copper	69	75¾
American Smelting & Refining Co.	85¼	88
Boston Copper	12⅜	14⅝
Butte Coalition	25	27
Cumberland Ely	7⅞	9⅛
Dolores	7⅛	7
El Rayo	2	2
Giroux	3¾	3½
Greene-Cananea	10⅞	12¼
Indiana Sonora	4¾	4⅞
La Rose	5⅜	5⅜
Miami Copper	7	8¼
Nevada Consolidated	12¼	14¾
Newhouse	5½	6¾
Nipissing	7⅛	7
Ohio Copper	2⅝	2⅞
Tennessee Copper	36	39⅛
Utah Copper	34⅛	39¼
Yukon	3¾	4⅛

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, July 30.

Atlanta	$ 25	Manhattan Con	8
Belmont	98	McNamara	63
Columbia Mtn	23	Midway	44
Combination Fraction	1.40	Mohawk	...
Daisy	74	Montana Tonopah	1.45
Fairview Eagle	40	Nevada Hills	1.70
Florence	3.15	Rawhide Queen	60
Gold Bar (Bullfrog)	4	Sandstorm	33
Goldfield Con	5.75	Silver Pick	22
Gold Kewanas	40	St. Ives	34
Great Bend	32	Tonopah Extension	85
Jim Butler	29	Tonopah of Nevada	7.97½
Jumbo Extension	53	Tramp Con	18
Laguna	1.10	West End	59

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. July 30.		Closing prices. July 30.
Adventure	8¼	Mass	7¼
Ahmeek	75	Mohawk	68¾
Allouez	35¼	Nevada Con	14⅞
Amalgamated	76¾	North Butte	84½
Arcadian	4	Old Dominion	40½
Atlantic	16¼	Osceola	110
Bingham Con	50	Parrot	28¼
Boston Con	14¾	Phœnix	50
Butte Coalition	27⅛	Quincy	98
Calumet & Arizona	124	Rhode Island	4¼
Calumet & Hecla	665	Santa Fe	2⅛
Centennial	29	Shannon	15¼
Con. Mercur	40	Superior & Pittsburg	14⅝
Copper Range	79¾	Tamarack	77
Daly-West	10½	Trinity	15½
Franklin	12⅜	Utah Copper	39
Granby	106	Victoria	6
Greene-Cananea, ctf	12	Winona	6⅞
Isle Royale	23¾	Wolverine	142

General Mining News.

ARIZONA.

COCHISE COUNTY.

The directors of the Willie Rose Mining Co. held a meeting at Portal last week and decided to resume work on the property 18 miles north of that place. F. O. Bacon has been appointed superintendent, and he expects to have operations under way early in August.——The new shaft at the Savage is now down about 115 ft., and the first station is being cut, preparatory to opening up the 100-ft. level. On this level a cross-cut will be run in a southerly direction to the orebody, which is not very far away.

MOHAVE COUNTY.

The Grand Boy mine, near Chloride, has purchased a small hoist and will use it in sinking a shaft to a depth of several hundred feet.——Reports from the mines of the Arizona Southwestern Copper Co. indicate that a large flow of water has recently been struck, and as a consequence operations have been suspended pending the arrival of a pumping plant. In the meantime a new shaft will be started at the Pittsburg claim of the group.——It is possible that the Gold Road M. & E. Co. will change its motive power from gasoline to electricity and also remodel its mill. J. de Salmard, of Goldroad, is superintendent.

YAVAPAI COUNTY.

Plans for the re-opening of the old Stonewall Jackson silver mine in the Globe district, and for the exploration of adjacent claims, numbering 32 in all, have been completed. V. Y. Smith is president of the new McMillen Silver Mining Co. The existing 120-ft. shaft will be sunk to at least 300 feet.

YUMA COUNTY.

The Harqua Hala, in the Ellsworth district, 8 miles south of Salome, has suspended operations, but will resume on a larger scale September 1. The company is making preparations to install a large cyanide plant to treat tailing. It will also start a new working shaft.

CALIFORNIA.

INYO COUNTY.

Work is about to be resumed on a small scale on some copper claims 12 miles northwest of Mammoth, on Shady creek, the original location of which was made by J. W. Drouillard. The company is a Chicago concern called the Cascade Mining Co., in which the same people are interested that have taken hold of the Casa Diablo. The property is in one of the roughest parts of the Sierras, at the headwaters of the San Joaquin river, and it will cost a large amount of money to get it into shape. The claims are 15 miles in an air-line from the end of the Bodie and Benton road at Mono mills.

NEVADA COUNTY.

(Special Correspondence).—J. W. Jacquib and E. F. Hiltom, large owners in the Morydena mine, are inspecting the property with a view to the early resumption of activities. A promising vein lies at the bottom of the shaft.——The adit being driven at the Leduc mine is in 125 ft. Progress is slow owing to the hard rock. A compressor will be installed in the near future.——Only two shifts are working at the Brunswick. No report has been given out by the officers, who recently inspected the property.——A force of men are cutting a station at the 5300-ft. level in the Central shaft. Lower stations will be cut within a short time. ——The insurance rates on local mining properties have been reduced. This means a considerable saving for several companies.——Arrangements are under way for the resumption of activities at the Gold Flat mine. As soon as matters can be adjusted the mine will be unwatered and the shaft sunk to considerable depth. It is reported that the Gold Flat people are desirous of securing the Pittsburg, an adjoining property. Both mines could be worked through one shaft.

Grass Valley, July 27.

SHASTA COUNTY.

The output of the Quartz Hill mine will be greatly curtailed by the Mammoth Copper Co. on account of the heavy shipments coming to the Kennett smelter from the Utah mines of the United States Mining Co. Shipments of from 100 to 150 tons per day are being made because of the injunction prohibiting the smelting of sulphide ores at the Utah smelter. The Utah ores are especially well adapted for fluxing ores and take the place of the Quartz Hill ore at the Kennett smelter.

SIERRA COUNTY.

The Keystone mine, near Sierra City, has been closed down for a short time in order that an auxiliary electric plant may be installed. The mine employs 40 men.—— Work has been resumed at the Gibralter mine at the head of Canyon creek. A shaft is being sunk in the hopes of striking a gravel channel.——An 18-ft. vein has been uncovered at the Grizzly Consolidated, at Poker Flat, and there are 100 tons in the ore-bin ready to be treated.——A strike of rich gold ore was made in the Twenty-one mine, at Alleghany, last week. The strike was made at a depth of 100 ft. more than any ore in the Tightner, its near neighbor, and for that reason the strike is encouraging.

SISKIYOU COUNTY.

At the Tennent mine, on Long gulch, near Hawkinsville, at a point less than 100 ft. from the old shaft, a blind vein has been uncovered which is 30 in. wide. In sinking seven feet on the vein it widened out to 42 in. Indications from panning led to the belief that the ore is quite rich.——A Chinese company is just finishing a wing dam preparatory to working one of the rich bars on the Scott river, at the historic old camp of Scott Bar.——The Sheba mine, on Patterson creek, for several days ran with a few men doing development work, as it was thought the orebody was giving out. Last week they uncovered a large body of very rich ore in the shaft and now have a large crew steadily at work. The mill is running day and night. The company is preparing to sink a shaft 1000 ft. deep on the orebody.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Empire Railway Mining & Milling Co. has recently been incorporated, and will take over the Silver Mountain mill, at Empire, which will be overhauled and the capacity increased from 25 to 50 tons per day. It has water-power rights on Clear creek and Middle Clear creek which will be developed, and the power used for operating the mine and mill, and also furnished to the operators of the district. It is also understood that an electric tram-line from the mine to the mill will be put in. The Silver Mountain mine, of which this company is the owner, has a large amount of development work already done through shafts and laterals. Compressor and drills will be installed.——A number of Eastern capitalists have become interested in the Everett and Lebanon mines, on Republican Mtn. It has been decided to drive the Everett adit about 400 ft. to intersect the Elijah Hice vein. Work will also be started in the advance of the Lebanon adit to gain greater depth. Work on lode No. 10 has been under way during the past two years and regular shipments have been made. The ore is a heavy lead, carrying wire-silver in liberal quantities. Maxton Bros. of Georgetown are in charge of the work.——A 30-hp. Garden City fan has been installed at the Capital adit, the connection having been made this week. The Capital M. & T. Co. controls nearly 2000 ft. lying ahead of the present breast and the bore will be pushed forward to intersect the series of veins controlled. It is estimated that an average net production of $75,000 is being made monthly from this property. It has virtually been decided to construct another mill with a capacity of 125 tons daily. Whether a separate plant will be built or another section added to the one now in operation will be decided in a few days, or as soon as Mr. Cooper returns from Pittsburg, where he has been in consultation with the officers of the company. Such vast

reserves of mill dirt are now exposed in the working of the Aetna vein that some way must be provided for taking care of the product. A new strike is reported from the stope being carried at the extreme west of the Aetna drift, a body of heavy lead ore having been uncovered that is from 2 to 5 ft. wide, the assays of which give $45 per ton. This material will be shipped direct to the smelters.——A number of stockholders of the Waldorf Metals Co. are in camp making an examination of the holdings. Plans are now being perfected for extensive operations and work will be in full swing by August 1. Power-drills will be installed at the Huckleberry workings, power to be secured from the line of the United Hydro Electric Co. D. F. Sprousse is in charge.——R. Fisher is sending out occasional shipments from the Hercules, the ore being worth from $60 to $80 per ton. A new adit has been started for the gaining of greater depth. A body of smelting ore from 5 to 6 ft. wide has been exposed in the breast of the adit on the Coffin vein, on Young Mtn., in the Daily district. The ore is silver-lead-zinc, and mills $50 per ton. Recently a new adit was started, the heading of which has now penetrated the mineralized zone, a body of iron having been passed that is 2 ft. wide. Within 50 ft. the adit will cut directly under the shoot exposed in the upper workings.——E. M. Moscript of Idaho Springs, manager of the Butler mine, has started excavation for a modern concentrating plant. This operator has secured the services of J. G. Roberts, an experienced mill man, who will look after the building of the plant. It is proposed to treat the ore mined from the Butler property, as well as handle custom ore from the various mines of the district.——Work has been resumed on the Tam O'Shanter, which is an extension of the Puzzler. Small streaks of good grade ore are being encountered.——The Egan mill, in the Jackson district, has been sold to J. B. McCormick, of Pennsylvania, the consideration being $2500. The plant will be remodeled and fed upon ores from the Gold Leaf mine, of which J. J. Hoban, of Idaho Springs, is manager.——A number of improvements are to be made upon the 40-ton mill, operated by the Honest John M. M. & T. Co. Work in the Black Eagle mine has resulted in immense bodies of ore being exposed, and for this reason the capacity of the mill is to be doubled. J. F. Puchart, of Idaho Springs, is manager. Work has been resumed in the breast of the Honest John adit, the bore being in 2100 ft. The Marysville vein will be intersected within 75 ft.——The McClellan adit, which is exploiting the Freeland section, is now over 7000 ft. long, the second longest in Clear Creek county. During the past year the bore was advanced 1900 ft. Some weeks ago the Freeland vein was reached and now driving is under way to cut under the shaft workings. With the objective reached a 1200-ft. raise is to be made to drain the old workings.——Wm. Morgan & Co., of Idaho Springs, have taken a lease upon the dumps of the Gem mine. It is reported that a mill will be constructed in the near future.——Moritz Schlegel, of Empire, has started work upon the Surprise group of seven claims, situated at the head of Lyons gulch. On the Surprise vein a body of heavy iron sulphide ore has been exposed that is from 2 to 4 ft. wide.

Georgetown, July 25.

OURAY COUNTY.

Preliminary work at the Koehler adit is progressing satisfactorily. The transformer, bunk, and boarding houses have been completed and the water system is well under way. Twenty men are at work near the portal. The Koehler is a part of the San Antonio mines and is designed to develop at a greater depth the immense orebodies in which the Carbon Lake shaft has been sunk.——The Brazilian-Monitor Mining Co., expects to install a large amount of modern machinery at its property in Poughkeepsie gulch, near Ouray.

SAN JUAN COUNTY.

A contract for 100 ft. of driving on the Grizzly property, in Burrows Park, has been let to Bert Perry, of Lake City. ——A force of 16 men are at work at the Tom Moore property, above Eureka, and several cars of high-grade ore is ready for shipment to the smelter at Durango. The low-grade ore will be treated in the Hamlet mill, which is to be erected soon.——The Brazilian-Monitor Mining Co., near Mineral Point, is making good progress on a cross-cut tunnel, which is now nearly 300 ft., and has 150 ft. more to run in order to cut the vein.——The Copper Gulch M. & R. Co. proposes to do some active development on its property in Gray Copper gulch. It owns 67 claims covering about 600 acres of mineralized land. It is reported that a 1500-ft. adit will be driven into Red Mtn. E. S. DeGolyer and King C. Gillette are interested.

SUMMIT COUNTY.

A syndicate of Boston people has recently purchased the Carbonate, the Little Tommy, and the Golden Edge groups of claims on Baldy Mtn. The consolidated estate consists of 28 claims, a mill-site, and a mill. The new company will let a contract to advance the Golden Edge adit an additional 800 ft. The sale was made by A. H. Phelps, of Denver.

TELLER COUNTY.

The Union Leasing Co., which recently secured a lease on the Deadwood, adjoining the Hull City placer, on Bull hill, has made its initial shipment. After but a small amount of work the Company opened up a vein at a depth of 400 ft., from which assays showed the gold content to range from $100 to $200 per ton. The Union Leasing Co. is also operating several other properties in the district with great success.——L. W. Terril, who recently secured a lease on the Dexter property, on the west slope of Bull hill, will start active operations immediately. He will sink the shaft from the 600-ft. level to a depth of 1000 ft.——The Portland Gold Mining Co. will erect an experimental cyanide plant, with a view to determining whether the ores are adapted to that style of treatment.——The United States Reduction & Refining Co. has announced a new scale of treatment charges for the ores of the Cripple Creek district. The change will affect the shippers to only a slight degree, as the increase over the rates now in effect is small. The changes are as follows:

Ore Value.	Old Rate.	New Rate.
Up to $8 per ton	$3.50	$4.00
$8 to $10	4.00	4.50
½ to ¾ oz	5.00	5.25
¾ to 1 oz	5.50	6.00
1 to 1¼ oz	6.00	6.50
1¼ to 1½ oz	6.50	7.00
1½ to 2 oz	7.00	7.50
2 to 3 oz	8.00	8.50
3 to 5 oz	8.50	8.75

TELLURIDE COUNTY.

The Contention mine will soon resume active work. Ketzlub & Junker, who have a lease on the property, have been actively engaged in putting it in shape after the five years of idleness. They have cleaned up the shaft, retimbered it, and have purchased a 20-ton Huntington mill. Twelve men will be started at first and the number increased later on.——The Cashin copper mine, in the La Sal mining district, has resumed operation and is working 12 men.

IDAHO.

BONNER COUNTY.

(Special Correspondence).—The old Panhandle smelter, at Ponderay, has been financed by S. W. Gebo, of Montana, and the work of repairing and enlarging is in progress. Sufficient money has been guaranteed to cover debts and provide an operating fund. The plant will be increased to 250 tons per day, ores have been contracted for, and as soon as possible the plant will be blown in. Several months of financial failure have retarded work. Money for one year is now assured.

Ponderay, July 25.

SHOSHONE COUNTY.

(Special Correspondence).—The Hecla Mining Co., at Burke, has declared its usual dividend of $10,000. This is at the rate of one cent per share and is the 51st dividend

declared by the company. The grand total disbursed by the company now amounts to $1,590,000.——Oscar Nordquist has resigned his position as superintendent of the mill of the Shoshone Concentrating Co., near Sweeny at Wardner, and has been succeeded by G. Machan. This company was originally formed for the purpose of treating the tailing from the Sweeny mill which handles the ore of the Last Chance Mining Co. It was anticipated that a net return of about $1 per ton could be extracted from the tailing by a close treatment with special machinery. For some time the mill ran at a small loss, but it is understood that recent results have been satisfactory. The mill was designed by W. A. Bradley and embodies many of his own ideas.——An extremely rich strike of nearly two feet of steel galena has been made in the drift in the Mark Cooney group of claims, near Burke. Work on the property was stopped two months ago and at that time the face of the drift showed a slip. The first shot on the resumption opened up two inches of galena, the next 18 in., and the last about 22 in. The ore is of the highest grade shipping quality.——About August 1 an increase will be made on the force of men on the Interstate Mining & Milling Co.'s property on Nine Mile, and work on the driving of a 2800-ft. adit will be started. This adit is designed to intersect three veins. Work has been carried along steadily on the No. 3 level and a dozen men will be added to the long adit work while development on the upper workings will be continued without cessation. It is expected that the last of the veins will be cut in about a year. The orebodies will be tapped at a depth of about 800 ft. deeper than the lowest workings and from 800 to 1200 ft. from the portal.—— A meeting of the directors of the Imperial Mining Co. was held in Wallace at the beginning of last week and it was decided to go ahead with the preliminary work on the driving of a long adit. This will be about 2700 ft. in length and will tap the lead at an estimated depth of 722 ft. beneath the present workings, and give a total vertical depth of 1126 ft. A syndicate of Spokane and Wallace men has been formed to finance the work and there will be no assessment on the outstanding stock. It is the intention of this syndicate to build a wagon road and install machinery. It is estimated that the total cost of the work will be in the neighborhood of $30,000.——The Monitor Mining Co., whose property is near Saltese, Mont., has purchased new machinery to the extent of $7000. This includes a 60-hp. boiler, a 50-hp. boiler, and a compressor with a capacity of 540 cu. ft. per minute. It is expected that the installation of this machinery will increase the mine's capacity fourfold. It is the intention of the management to sink from the bottom of the 400-ft. shaft to the 700-ft. level before any more driving or stoping is done.——The famous action by Jonathan Bourne, Jr., against the Federal Mining & Smelting Co. has been decided by Judge Dietrich, of the United States Federal Court, at Moscow, in favor of the Federal Company. The case involved the extra-lateral rights of the Ontario lode claim owned by Mr. Bourne.—— The secretary of the Rainbow Mining & Milling Co. has submitted an annual report. This is to the effect that the main adit has been extended 307 ft., making a total length of 410 ft. Since taking over the group the Company has constructed a substantial bunkhouse and supplied a full equipment of machinery. The showing in the main adit has gradually improved during the last few months and the last 100 ft. of work has shown up from one to two feet of concentrating ore, some of which assays as high as 45 oz. silver, 14% copper, and a small amount of gold.——All right of way disputes with regard to the construction of the Idaho Northern railroad have now been settled out of court and it is now expected that the road will be in full working order by Christmas.

Wallace, July 25.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—Conditions throughout the mining district are still unsettled, every day noting the closing of mining plants and the re-opening of others. All the mines in the Oronogo camp are again active and that field is among the busiest in the district. However, most of the mines in Granby are closed and there is little work going on. The Whitsett mine belonging to the Old Dominion Co. closed down last week. The output for the week was normal and the market was more stable than for some time. The total value of the output for the week in the entire mining field was $226,624.——One of the latest and best producers in the Joplin camp is the Scranton land, west of the city. A large number of strikes have been made of high-grade zinc-blende. About five companies are at work upon leases on the tract. The ore is all found from 35 to 40 ft. and occurs associated slightly with bitumen, which renders the separation difficult. The first strike was made by Hubbard, Cummings & Marr, who struck a rich zinc-blende with a 17 to 18 ft. face. The ore was found at the 35-ft. level. One drift has been opened for 30 ft. and a second is started. Collins & Gray, operating a lease on the same land, entered the ore last week at 40 ft. The ore is being cleaned on hand-jigs. East of this company Turnbull Bros. have taken a lease and are engaged in opening an old shaft to catch the same run of ore. A fourth company on the same land is the Blue Bird, which re-opened an old shaft and have been making rich turn-ins ever since. A boiler and steam hoist have been installed and hand-jigs are treating the ore.——Another fast developing tract is the Riseling ground, upon which four mills have recently been built. The latest addition is the Symmes lease with a 250-ton mill. Three concentrating tables, for saving the fine, have been added to the regular mill equipment.—— Southwest of the city some rich strikes have been made and development work is being hastened. The W. E. Johnson land last week took third rank among the producers of the Joplin camp. Upon this land the Cleo Mining Co. opened a rich deposit of galena and zinc-blende at 97 ft., penetrating first a 5-ft. face of galena below which occurred an 18-ft. face of zinc-blende. Sufficient driving will be done to determine the extent of the deposit and a cencentrating plant will then be erected. The Company has not been hindered by water.——The interest and attention of mining men during the last few weeks has been turned toward the Oronogo camp north of Webb City. The Granby Mining & Smelting Co., one of the largest concerns in the district, has been doing a large amount of prospecting and development work since the financial depression of last fall. The result has been some remarkably rich strikes in Oronogo and an extension of that field. Upon a 30-acre tract, north of the Oronogo Circle Mining Co.'s land, four drill-holes were sunk, finding ore from the grass roots to 240 ft. The cuttings are estimated to run from 4% in the upper levels to 25% in the rich lower levels. A shaft is now down and machinery installed. J. H. McGee and associates, of Carthage, have leased the land and will develop it to the producing stage. Some of the most important work in the district is being done at present in the vicinity of Carthage, which is one of the latest important additions to the mining industry. The old Porter tract in the northwest part of the city is very active. This land has not been operated for some years until the past winter, when a new company leased the ground and began to drain it. A large pumping plant has been installed and had drained the land to 137 ft., when it broke down a few days ago. However, it will not be long until the ground is sufficiently free from water to enable the more shallow runs to be worked.——South of town a company of local men are developing a tract upon the Linzee ground. The shaft last week entered the main body of ore at 160 ft. At this point a 25-ft. face has been opened up. The dump pile is now rich in ore ready for treatment.——A good lead strike was made on the Weaver farm, northwest of the city, last week. The drill entered the ore at 127 ft. It is planned to have the shaft down to 175 ft. by the last of August. It is upon this farm that some of the richest strikes of the past year have been made.——On the J. H. Harris land, adjoining the Weaver farm, two levels of ore have been developed. Nine drill-holes have been put down to an average depth of 240 ft. Ore has been found at the 100-ft. level and a lower run at

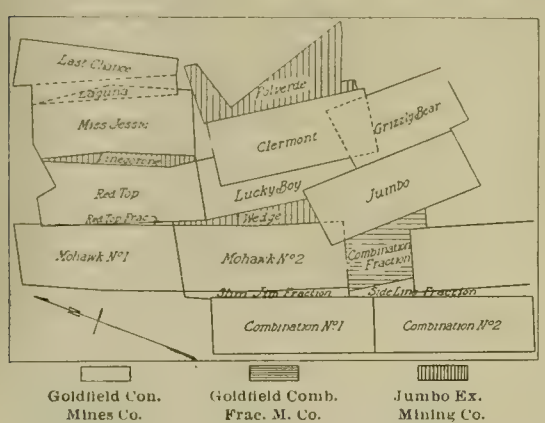
200 ft.——At Pierce City, east of Carthage, a rich strike was made recently which is the more important since the land around the city is virgin territory. A. B. Bowen & Sons made the strike on the Fred Smith farm. A large deposit of rich rosin zinc-blende was struck at 65 ft., continuing to 95 ft. Five drill-holes have been put down, all showing the same formation. The extent of the deposit and its richness make it an important find.

Joplin, July 25.

NEVADA.

ESMERALDA COUNTY.

The controversy between the Goldfield Consolidated Mines Co., and the Jumbo Extension Mining Co. has been adjusted out of court. All future disputes between the Consolidated Mines Co. and the Jumbo Extension Mining Co. regarding ores or other questions are to be submitted to a board of arbitration, the rulings of which shall be final. The Gold Wedge claim goes to the Consolidated, subject to the leases of the Mohawk Ledge and the Mohawk Jumbo, both of which will hereafter pay royalties to the merger people. In return for the above, the Consolidated releases all claims for ore removed up to the time the action was instituted. The Consolidated Company takes the right to mine the Vinegorone claim, half the net proceeds to go to



Territory Recently Under Dispute at Goldfield.

the Jumbo Extension, the title to the claim to remain as at present. Title to the Polverde claim remains with Jumbo Extension. Veins of the Polverde which may apex in Consolidated ground may be mined by the Jumbo Ex. or Consolidated, with an allowance of $10,000 from the joint account to the corporation developing the vein, the ore returns to be divided half and half. This agreement will give an immediate and beneficial stimulus to affairs in the camp and a number of the lessees have already started work, on the same scale as when stopped by the injunction of the United States Court last February.——The terms of the agreement between the Goldfield Consolidated Mines Co. and the Goldfield Combination Fraction Mining Co. were arranged on July 30, and the ratification will be made and announced on Friday, July 31. By the terms the Combination Fraction is entitled to all ore within the vertical boundaries of its claim, but grants to the Consolidated a contract to mill all its ores on certain fixed terms. It is stated that these terms are better than could be procured elsewhere, and at the same time will net the Consolidated a fair profit.——The Baby Florence Co. has been completely re-organized and Lewis Rogers, of the Rogers Syndicate becomes general manager and is in complete charge of its affairs. J. F. Meikle has been appointed superintendent under rather a novel contract. He will receive one per cent of the net earnings of the lease give no guarantee. The Baby Florence is shipping from 15 to 20 tons per day running about $75. The lease runs until the second week in December. A new compressor has been installed and four power drills will be at work by the first of the week.——The Red Hills Mining & Leasing Co., which is operating a block of ground on the Red Hills property, added another shift to its working force and will now push development. The main shaft on the lease has reached a depth of 350 ft., and for the last 30 ft. a three-foot perpendicular vein has been followed.——The mines of Goldfield produced during the week ending July 25 a total of 2452 tons, the estimated value of which is $313,275. During the same period the Tonopah mines produced 6065 tons of an estimated value of $156,175.

LYON COUNTY.

A company of California people, headed by A. L. Anderson, have taken a bond and lease on the Mountain View group of claims and an option on the controlling interest in the Red Crow Co.——The first shipment of ore was made from the Big 20 lease last week. The ore was hauled to Schurz and shipped to the sampling works at Hazen. Forty tons of the shipment will probably assay at least $100 per ton.

NYE COUNTY.

The apex-suit between the West End Con. Mining Co. and the McNamara Mining Co. has been amicably settled outside of court. The terms of the agreement are as follows: The right of the West End Co. to certain stock of the McNamara Mining Co. which has been the subject of litigation in the courts is now recognized and confirmed by the latter. The litigation over the orebodies has been dismissed and the injunction against the McNamara Co. has been dissolved, and the West End Co. and its sureties released from all claim for damage on account of the injunction. Each company holds all veins, or parts of veins, found within the vertical boundaries of their respective properties, neither party being permitted to follow any vein, or parts of veins into the property of the other.——The Springdale mill, at Beatty, is rapidly nearing completion, and will begin operations during August. The plant is the property of the Springdale Mining & Milling Co., and may handle some custom ore in addition to company ore.——An explosion of a compressed-air pipe in the Belmont mine did some damage to the shaft and electric wiring, but no injury to any workmen.

WHITE PINE COUNTY.

James & Doran have started a force of eight men to work sinking a shaft on the Copper Bond No. 9. The property is a considerable distance southwest of the Veteran mine.——The Keystone churn drill, which Thomas Rockhill is sending to Snake valley for prospecting the placer fields between the valley and the Osceola Mtn., left Ely last week. The machine was hauled by teams and not under its own power, as was first planned.——W. J. Corbett shipped two carloads of tailing from the old Monitor mill-dump to the smelter last week. The shipment amounted to 60 tons from which returns of $30 per ton are expected.——The Copper Mines Co., successor of the Ely Mines Co., is now doing some extensive development work on its property immediately north of the Star Pointer shaft of the Nevada Consolidated, where a force of 25 miners is employed.

OKLAHOMA.

OTTAWA COUNTY.

(Special Correspondence).—Miami, the infant of the mining district, is a busy scene. The large extent of the deposits and the unusually high percentage of ore in the dirt make this a camp of great interest. A number of prospects have been developed sufficiently to warrant a mill. Four plants are now operating and several in the course of erection. The Lucky Strike, which has been leased to the Kenwood Co., will build a mill of 100 tons in the near future. A shaft is now being sunk. Three drill-holes on the 5-acre lease struck ore at 110 ft. with the face from 7 to 17 ft. thick.——A rich drill strike was made on the Baxter Royalton's land by J. W. Barnes. The dirt runs 20% zinc-blende. This is the third drill-hole showing ore on the land. The little Maxine, to the north of this lease, has made a strike with a 36-ft. face. This is the largest

face of ore found in the camp.——The King Jack mill, upon the property of Chapman & Lennan, is almost ready for operation. It is a second-hand plant moved to the lease. The mill will handle 200 tons per shift. A well developed body of galena and zinc-blende is ready for treatment on this lease. The Buckeye plant, brought from Baxter Springs and erected on the Buckeye lease, will be ready for operation within a fortnight.——Barnes, Wiggington & Milton, of Webb City, have leased a 10-acre tract, one of the richest in this camp. The drill entered ore at 86 ft., and in two runs, with only a thin sheet of flint between, a 50-ft. face was uncovered. A shaft is being sunk and preparations are under way for the erection of a mill.——The Emma Gordon, the new 400-ton mill, has been making a record since its initial run. The tonnage from this new plant has run as high as 200 tons of clean concentrate per week.

Miami, July 25.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The lessees of the Republic mine shipped their second carload of ore to the Granby smelter, at Grand Forks, B. C., July 20.——The Advance Mining Co. has made a new strike on the 300-ft. level. It consists of several feet of highly mineralized quartz, with a 16-in. streak of high-grade galena. The company will double its force next month. O. F. Parmeter, of Covada, is the superintendent.——The Keller & Indiana Smelting & Development Co. has started work on the upper adit-level of the Manilla mine and will soon begin hauling ore to the smelter. A raise has been started to provide ventilation. A winze will be sunk on the main ore-shoot, to determine its direction. New track has been laid in the lower adit, which will be connected with the ore-shoot. A wagon road to the lower adit is under construction, and at the portal of that adit, ore bins will be constructed. The company expects to begin hauling ore about August 10 and will then install electric drills.

Republic, July 27.

OKANOGAN COUNTY.

(Special Correspondence).—The Butcher Boy mine, at Chesaw, is shipping ore to the Granby smelter, at Grand Forks, B. C. The Grant and Olentangy quartz mines and the Bethel placers are the only active mines in the district at present, although several smaller properties are desultorily operated.——A government engineering staff is in the field checking past work for the establishment of the international boundary.——Operations have been suspended on the Palmer Mountain Tunnel & Power Co.'s property—both mine and mill. E. W. Biedler, the superintendent, has resigned, and rumor says that John Boyd, the general manager, has resigned also. F. G. Burnham, of Holyoke, Mass., who is familiar with the property, has arrived and will take charge of it for the present.——It is reported that Monroe Harman, manager of the Ruby mine, at the base of Mt. Chopaca, who has been East several weeks, is expected home in a few days, accompanied by a party of Helena, Mont., men, who will put up a chlorination plant for the treatment of the Ruby ore. There are several thousand tons of medium and low-grade ore on the dump and blocked out in the underground workings of the mine, which will not pay to ship, but may be profitably treated on the ground.

Chesaw, July 27.

STEVENS COUNTY.

(Special Correspondence).—The First Thought Extension Mining Co. has been organized to operate the Effie R. group of three claims, lying east of the First Thought mine. The manager is G. T. Eves, of Orient, Ferry county.——The Hester Mining Co. will resume work on the Regina mine, on Pierre creek.——A three-year contract has been made to furnish 75 tons of iron ore per month from the Valley mine, at Valley, to a Spokane firm, for the manufacture of mineral paint.——Considerable native silver ore has been found on the 100-ft. level of the Ark Group Mining Co.'s Silver Queen claim.——Two more furnaces have been blown in at the Northport smelter to accommodate smelting ore from the Josie mine, of Rossland, B. C., and the First Thought mine, near Orient.——The mines from two to ten miles down the Pen d'Orielle river from Newport, are improving, and several will be operated this year that have been a long time idle. The promised activity arises from the announcement that the Idaho & Washington Ry. will be continued down the river.——The Bornite Mining & Smelting Co. has purchased the Lucky Bill and Ballarat mines, near Northport, and now owns a group of ten claims.——A contract has been let for a 100-ft. adit on the Liberty copper mine, near Chewelah. The adit has been driven 300 ft. and it is expected the vein will be struck on the new contract. ——F. C. Bailey has taken charge of the Jay Gould mine and resumed operations, expecting soon to again ship ore. ——The Mammoth-Morning Concentrating Co. will build a concentrating plant of 50 tons daily capacity for the treatment of ore from the Mammoth and Morning mines, to be ready about October 1. The Mammoth and Morning companies, being practically identical in membership, are about to install an air-compressor, at an expense of $6000, for the use of the Mammoth and Morning mines, and draw power from the concentrating plant, which will be equipped with three 80-hp. boilers. The Morning Co. is driving an adit, and stringers in the face indicate an approach to the main vein.——A good wagon road has been completed from Sullivan creek to Slate creek, and the property of the Metaline Mines, Ltd., which consists of a group of eight claims and water right at the falls of Slate creek, affording power sufficient for large milling operations. A railway is being surveyed into Metaline.——A plan is afoot to re-organize the Deer Trail Mining Co., whose property is near Springdale. In 1907 the Bonanza, one of the company's claims, produced 380 tons of ore which yielded a net profit of about $8 per ton, when lead, one of the principal products, was at its lowest quoted price. William Chaplin, of St. Catherine, Ont., is the largest individual stockholder, and advanced the company $12,000, when the shipments were stopped. In order to liquidate and re-open the property he offers to put up more money, he owning 700,000 shares, if the other shareholders will agree to his proposition—a sale of the company's assets, he to bid on them to the extent of his claim, then to form a new company, with the same number of shares as the Deer Trail, at ten cents, paid up to the extent of three cents. Mr. Chaplin proposes then to assign the assets to the new company and to give share for share of the new stock for the old.

Republic, July 25.

CANADA.

BRITISH COLUMBIA.

The Canadian Girl and the Yankee Girl claims on Dundee Mtn., at Ymir, have been bonded to Harry L. Rogers, of Spokane, for $40,000.——A recent flood and subsequent landslide uncovered a 25-ft. vein of silver-lead ore at the property of the Vancouver Mining Co.'s property, near Silverton. The Vancouver is being operated by the Le Roi No. 2 Co., which took over in the summer of 1906 M. S. Davys' lease and option from the Vancouver company. Paul S. Couldery, of the Le Roi No. 2, has left Rossland for Silverton and will immediately assume charge of operations on the property.——Valuable ore has been struck on a group of claims owned by John Morrell and Salvatore Bonnacci in Franklin camp. Samples taken from the bottom of a 20-ft. shaft are said to have assayed $380, $395, and $1100.

Following is the tonnage of ore shipped from and crushed at the mines of Rossland for the week ending July 18, and for the year to date:

Mine.	Week.	Year.
Centre Star	2,780	96,111
Le Roi	1,050	45,749
Le Roi No. 2	385	13,764
Evening Star	35	558
Totals	4,270	156,507

The district shipments were as follows: Rossland, 4270 tons; Boundary, 36,097; Slocan Kootenay, 1733. Total for week, 42,100 tons.

Special Correspondence.

LONDON.

Tominal Mining Co., Mexico.—De Lamar Mine, Idaho.—Lena Goldfields, Ltd., Flotation. — Van Roi Mining Co., Slocan, British Columbia.

The first annual report of the Tominal (Mexican) Mining Co., Ltd., which has just been issued, is rendered interesting by the confliction of opinions between the general manager and the mining engineer as to the extent of the ore reserves and the metal-content of the ore. The general manager is Parry Gosset, who was promoter and vendor, and the engineer is G. W. Schneider, who views the property as a stranger. Mr. Schneider estimates the ore reserves at 5750 tons, averaging about ₱60 per ton, and the dump at 20,000 tons averaging ₱20. He is also careful to apply to the ore reserves the objective 'probable.' Mr. Gosset, on the other hand, puts the dumps at 30,000 tons, running ₱30 per ton, and the probable ore reserves at 12,000 tons, and protests against Mr. Schneider knocking out the high assays in calculating his averages. Mr. Gosset, in his report, in an affable manner excuses Mr. Schneider as he "has had the disadvantage of not being acquainted with Mexican mines or customs, and could not be expected to completely grasp the situation." Naturally Mr. Gosset is prejudiced, but I believe that two unprejudiced engineers would be just as liable to differ in their estimates. The ore is silver sulphide, containing some gold, and occurs together with white quartz in andesite. The width and contents of the veins vary widely. As regards the method of treatment, it is fairly certain that the Butters cyanide process as worked at the Copala mine in the same neighborhood will be adopted. The cash resources of the company are not great, and most of the expenditure is going into development at present, in the hope that if large bodies of ore should be opened up it will be easier to raise the necessary funds for a mill.

There is every prospect of the De Lamar mine, Owyhee county, Idaho, again earning profits for its English shareholders, for during the last two years sufficient profit has been made to wipe out the losses of three years ago. This mine was originally floated in London, in 1891, by Mr. Bratnober, and for five years considerable profits were made. Later on, however, the main veins gave out, and the profits shrank. In 1901 the company was reconstructed and the nominal capital reduced from £400,000 to £80,000. During the ten years of its life the old company distributed £500,000 as dividends. For the first five years the dividends averaged 22½%, but sunk afterward to 2½. With the reconstruction the reduced capital made the rate of dividend appear higher again, and during the four years 1901-5 a total distribution of £70,000 represented 87½% of the capital. During the next year losses to the extent of £16,000 were incurred, which have since been wiped out by the profits during the two years ended March 31, 1908. The mine has still some extensive ore reserves, and with the excellent modern plant now installed should continue to yield profits for some years to come. During the year ended March 31, 1908, the quantity of ore treated was 32,002 dry tons, assaying $8.74 gold and $3.78 silver. The yield was 13,749 fine oz. gold and 158,994 oz. silver, the extraction being 92½ and 60½% respectively. The tendency has been to finer grinding, and practically an all-slime process has now been adopted.

The appearance of the prospectus of the Lena Goldfields, Ltd., is some indication that the financial side of mining is taking a turn for the better in the city of London. This company has been on the stocks for quite a while waiting the convenience of financial houses and investors generally. It has been formed by the Russian Mining Corporation, a company supported by the Venture Corporation, the Consolidated Mines Selection Co., the Consolidated Goldfields of South Africa, and certain continental financial houses. Its function is to acquire the whole or the larger part of the share capital of the Russian company of similar name which has operated the properties for over forty years. The properties are very extensive, consisting of four separate groups, totalling over 100 square miles. They are situated in the extreme northeast of Siberia. The output from 1863 to October, 1906, was 2,392,021 oz., and during the year ended October, 1907, the output was sold for £843,000. The deposits are ancient river-beds and are worth nine dollars per cubic yard. They are worked as drift mines, the development and extraction of gravel continuing throughout the whole year, and the washing going on from May to October. The report on which the directors rely was made by Charles M. Rolker, who made a complete examination of the Bodaibo section of the property. He estimates the profit on that part of the deposit to be greater than the present share capital, so that the company starts out with excellent prospects. The vendors take their purchase price in shares, and will no doubt market them at a substantial premium.

A few months ago, when referring to the Le Roi No. 2 at Rossland, B. C., I mentioned that it was the intention of the company to take up the Vancouver group of silver-lead claims at Slocan, if the development work turned out well. Alexander Hill has just returned from a visit, during which he found the mine turning out so well that he has recommended the purchase of the property. A subsidiary company has accordingly been formed called the Van Roi Mining Co. The capital is £34,500, divided into 30,000 preference shares of £1 each, and 90,000 deferred shares of one shilling each. The preference shares are now being offered for subscription, and the proceeds will provide the purchase price, $100,000, and the necessary working capital. Subscribers to preferred shares will be offered one deferred share for each preferred share allotted, and the other 60,000 deferred shares go to the Le Roi No. 2 Co. in satisfaction for the money spent in development work. The preferred shares are entitled to 40% dividend each year, and any further profits will be divided into four parts, one part going to the preferred shares and three parts to the deferred shares. When £30,000 has been distributed on the preferred shares, the preferred and the deferred will rank equally for dividend. The ore deposits are of lenticular shape and are said to be difficult to sample accurately. Mr. Hill, however, estimates that 60,000 tons are ready for extraction, averaging 4½% lead, 10% zinc, and 15 oz. silver. There will be no great trouble in concentrating, and he estimates that the production would be 4060 tons of lead concentrate, averaging 60% lead, 11% zinc, and 115 oz. silver, and 5750 tons of zinc concentrate averaging 45% zinc, 2% lead, and 40 oz. silver. The net income from these is figured at $80,730 for the zinc concentrate, and $292,157 for the lead concentrate. The costs are taken at $2.65 per ton of ore, equal to $161,650, leaving a profit of $211,237, or £43,000.

KALGOORLIE, WESTERN AUSTRALIA.

Koolyonobbyn District.—Trans-Australian Railroad Surveys. — Gold Production for May.—Ivanhoe Report.—Decision in Gold-Stealing Case.—Kalgoorlie School of Mines.

Developments at the new find in the Koolyonobbyn ranges are not so promising as they appeared at first. The State Mining Engineer is to report. The survey party, consisting of 30 men and 90 camels, for the trans-Australian railroad left here last week. They will keep on about the 31st south parallel and be out nearly a year. A number of prospectors will follow. A well-equipped prospecting party left Southern Cross on June 1 and will cut across to Mt. Magnet. The Minister for Mines has given six-months' supplies. Splendid rains have fallen, so parties in the field ought to have little trouble. The gold output from the State in May was valued at $2,800,000, and dividends totalled $69,000. Kalgoorlie's May production was $1,600,000 from 130,000 tons. Affairs at the Associated, Great Boulder, Horseshoe, Ivanhoe, and Kalgurli are very satisfactory, but the Brownhill, Associated Northern, and Oroya group on the Eastern side of the belt are anything but promising.

The returns and dividends for May are as follows:

	Tons.	Value.	Profits.	Dividends.
Associated	10,443	$105,000	$39,500	.....
Associated Northern..	3,703	46,000	25,000	.....
Great Fingal.....	22,181	175,000	64,000	.....
Great Boulder.....	16,063	240,000	130,000	.....
Gt. B. Perseverance..	17,139	110,000	13,500	.....
Golden Horseshoe....	22,990	255,000	100,000	.....
Hainault	5,964	34,000	4,900	.....
Ivanhoe	19,444	210,000	105,000	.....
Kalgurli	10,910	150,000	82,000	.....
Kalgurli South.....	9,033	61,000	7,500	$25,000
Lake View Consols...	9,740	65,000	10,000	.....
Lancefield	7,313	45,000	*18,000	.....
Oroya-Brownhill	12,019	80,000	21,000	.....
Oroya-Black Range...	4,318	54,000	21,000	.....
Sons of Gwalia.....	13,205	95,000	20,000	.....
Sons of Gwalia South..	1,998	26,000	12,000	.....

*Loss.

Connection has been made between the Main and Edward's shafts at a depth of 2200 ft. in the Great Boulder, the ore being high-grade. The latter shaft is to be the main hauling shaft, and Thompson & Co., of Castlemaine, Victoria, are making the new hoist. It is to be a vertical, twin-tandem compound, direct-coupled, condensing engine, with two high-pressure cylinders, each 16 in. diam, two low-pressure cylinders, each 28 in. diam., and a stroke of 42 in., steam pressure to be 160 lb. per square inch. The drums are 12 ft. diam., and the engine is capable of lifting 3 tons net from a depth of 4000 ft. The Golden Horseshoe has just started its 60-drill Ingersoll-Rand air-compressor, and also a 500-kw. generator, driven by a steam turbine, made by the A. E. G. The Kalgurli has started sluicing away its filter-press residue. This company has an advantage over others in this line, as it is 140 ft. above the surrounding country, and consequently no pumping is required.

The Ivanhoe annual report makes interesting reading. It is not a long one, but everything is there, while the mine-plans are very creditable. Ore reserves estimated by the general manager, Mr. Nicholson, total 926,737 tons, at $12.52 per ton; while the estimates of the consulting engineers, Bewick, Moreing & Co., are 1,049,714 tons at $11.56 per ton. In a mine so well opened up as the Ivanhoe, one would think that closer estimates could be made than the above. This mine has paid $9,900,000 in dividends to date. Costs for the past year totalled $5.28 per ton. The tonnage in 1907 was 231,500 for gold, valued at $2,600,000, and the profit was $1,300,000, of which $1,200,000 was paid in dividends. Development for the year totalled 6964 ft. It was feared last month that there would be trouble with the engine-drivers on hoists and stationary engines, as they wished for higher wages. The case was cited for the Arbitration Court, but at a conference with the Chamber of Mines, a 12-months' agreement was arrived at as follows: $3.20 for underground hoists and the minimum for surface hoists; $3.36 minimum for surface hoists; and $3.60 for main shaft hoists per 8 hours, the week to total 47 hours.

Although there have been no reported cases of gold-stealing of late, yet it is believed to be fairly strong, all the same. A case was tried some time ago in which a man was seen by the detectives to take a parcel of telluride specimens out of a cart and place it in a tank. He was arrested and given three months' hard labor, but appealed to the Full Court in Perth. The Judge decided that when the police catch a man he must have the gold actually on his person, and the conviction failed. The Judge remarked at the same time that as the law stood it was very difficult to secure convictions. However, the police have re-arrested the accused on another charge. It is just on these apparently trifling technical points that most of the offenders get off scot free.

There are 284 students attending the local School of Mines. Technical education in this State is under Government supervision, and besides the local school, colleges are in full swing in Boulder City, Menzies, Coolgardie, Cue, and Perth, all under the control of F. B. Allen, Director of Technical Education for W. A. The local School of Mines is well equipped for teaching assaying, chemistry, electricity, and engineering. A very fine geological museum is in the same grounds. Besides containing maps, plans, photographs, and specimens of ore from this State, it also contains specimens from all parts of the world, being valuable to the students. The public are also admitted. R. B. Nicholson, of the Ivanhoe, is to visit England shortly. Mr. Borrowe has resigned the management of the Perseverance, and proceeds to Mexico by way of London. Temporarily Hogan Taylor is in charge of the Perseverance.

TORONTO, CANADA.

Increased Output From Cobalt.—Exploring Under the Cobalt Lake.—Government Explorations for Coal in the East. — Iron-Ore Deposit Near Montreal.

The shipping mines of the Cobalt camp now number 26, the output of which for the first six months of the year was 9151 tons, as compared with 6543 tons for the corresponding period of 1907. In addition to the increased volume of the output, the value per ton is higher, owing to the extensive treatment of low-grade ores at the concentrators before shipment. The La Rose, O'Brien, and Nipissing are well in the lead as to tonnage and assay-values. The month of July opened well, shipments for the week ending July 11 being 483 tons, from the following mines: Cobalt Lake, 47; Kevi Lake, 30; La Rose, 41; Nipissing, 63; Nancy Helen, 93; O'Brien, 95; Peterson Lake, 20; and Silver Queen, 90 tons.

Another rich discovery has been made at the Nipissing on new territory lying north of Cobalt town, opened up this season. From two to three miles of trenching has been done on this lot leading to the discovery of several good veins, and this week a calcite-silver vein was encountered at a depth of 80 ft., having an average width of 10 in., and containing several thousand ounces of silver per ton. At the Chambers-Ferland development is being actively pushed under the direction of W. H. Jeffrey, an experienced mining man. Three shafts are being sunk. Shaft No. 1 is on the vein No. 4, between the La Rose and Nipissing properties, and will be cross-cut at the 100-ft. level to strike parallel veins. Shaft No. 2 is down 90 ft. on the rich O'Brien vein, which crosses the property; and Shaft No. 3 is being sunk on vein No. 7, close to the La Rose. If juxtaposition counts for anything, this property should hold a leading place among the shippers. The Little Nipissing Co., while not successful in striking anything valuable on its own ground, where development is being steadily continued, is doing very well with the Peterson Lake, which is being worked under lease. The shaft is down 100 ft., and cross-cutting has been started to pick up the vein which left the shaft at 80 ft. The Cobalt Lake Co. has issued a statement showing the work done during the first six months of the year, which included 1222 ft. of driving, 160 ft. of sinking, and 30 ft. of raising. Sinking has been discontinued for the present, and the force is driving adits beneath the Lake at three points. The Silver Leaf realized upward of $200,000 from the last two carloads of ore shipped. The new shaft has reached a depth of 170 ft., at which point the vein, originally struck at 125 ft., shows a width of 4 in., and assays about 500 oz. silver per ton. At the 125-ft. level a station has been cut, and driving along the main vein will be started. A fire at the power house of the Silver Queen on July 12 damaged the plant to the extent of about $20,000. In the course of cross-cutting at the Crown Reserve on the 50-ft. level of No. 1 shaft, a vein 10 in. wide was struck, running parallel to the main vein about 5 ft. distant. It shows a high silver content. Some good finds in the unsurveyed territory south of Lorraine township are reported. Bert Grover has obtained two large nuggets of nearly solid silver from his location. At the Keeley property good ore is being taken out. On the Cragg location, in Smythe township, on the Montreal river, a vein 3 in. wide has been encountered in the diabase, heavily impregnated with native

silver. It has been stripped for over 200 ft. The sum of $35,000 has been appropriated by vote of the Canadian parliament to be devoted to boring for coal, oil, and gas. The Minister of Mines explained that it was intended to use this amount, or most of it, in explorations on Prince Edward island, where the geological formation indicates that coal may exist, although no deposits have as yet been found. The announcement is officially made that the Attorney-General's department of Ontario will make an active endeavor to procure the extradition of William Lockhard Russell, under indictment for some time for conspiracy to defraud in connection with the flotations of the Highland Mary, Blue Bell, and other 'wild-cats.' Russell left the country for England while the case was in progress, and his partner, Frank Law, was arrested. Law has now given evidence to secure Russell's extradition, and it is understood that the case against him (Law) will be dropped. Russell, it is said, is now in the United States. The operations of Law & Co. are said to have yielded them upward of $300,000.

Canadian Pacific railway officials announce the discovery of deposits of iron-ore of fine quality, yielding 60% iron, in the Laurentian mountains, about 100 miles from Montreal, the exact location being kept a secret. Steps are being taken by the company looking to securing the property. As the St. Maurice forges, which turn out iron of a fine grade, are in the same range, the find is regarded as an important one.

MEXICO.

Comment on New Mining-Law Project. — Oaxaca Smelting Plants.— Blowing in of Chihuahua Smelter. — Greene-Cananea Copper Company.

The provisions against foreigners and foreign companies acquiring mining lands in Mexico, that are embodied in the proposed new mining laws continue to be widely discussed throughout the Republic, both by the people and by the Mexican press, native and foreign, and there is an evident belief on all sides that the provisions were actuated by an anti-foreign feeling. This has led to a rather bitter article in one of the leading dailies of Mexico City, *La Patria*, edited by Lic. Emeterio de la Garza, Jr., a prominent young attorney. The article touches lightly on some of the provisions limiting the rights of foreigners, and then states that the proposed laws are not based on any anti-foreign feeling, but represent a movement in the direction of maintaining the self-respect and dignity of Mexico; that already the foreigner receives better treatment than the Mexican himself. He asks why the Mexican should cater to the Yankee. If the foreigner does not like the laws he is free to leave. Evidence shows that the restricting articles in the proposed new mining law have already held up many new mining deals that involved millions of pesos, and it is affecting all kinds of enterprises and investments as well as mining. Capital is becoming skeptical, and even if the new provisions are not passed, there will remain a feeling that the adoption of such restrictions is but postponed. The older men are the strongest in their arguments against the objectionable articles, which is significant. There is not in Mexico an amount of home capital necessary to carry on mining by modern methods, and on the immense scale practised by foreign corporations for the handling of the large bodies of low-grade ore. At the beginning of this century Guanajuato was a presumably worked-out and practically abandoned camp, with scarcely a foreigner in it. Then the Sirena was taken up by foreigners (the Guanajuato Con. M. & M. Co., of New York), and it was followed by others, all of whom have invested fortunes in development work, and in the erection of immense reduction works until, from almost nothing ten years ago, it stands today in the front rank of the gold and silver-producing districts of the world. There is scarcely a property in Guanajuato which is not a repetition of the story—worked by the Mexicans while in bonanza and until the water was reached, then abandoned until taken over and opened on a large scale by foreign capital. Furthermore, this capital has been almost wholly American. Others did not see far enough ahead; and in fact, many large British holdings were sold to Americans.

The Oaxaca smelter, of the Oaxaca Smelter & Refining Co., was sold at public auction on the first of July, and was bought in for the bondholders by H. D. Wilde, former auditor of the company, at $275,546, about two-thirds the cost of construction, no other bidders being present. Another representative of the bondholders, H. M. Holbrook, has gone to New York to consult with his principals, and it is stated there is a likelihood of the plant being started in the near future; at least before the first of the year. The other Oaxaca smelter, known as the Magdalena, of L. R. Hamer, which was blown in to smelt and clean up all the old stock of ore and stuff on hand, and convert them into funds, is now down again—it is feared indefinitely. But there is a confidence in the permanency of two other plants blown in during the week ending July 18. One is the new plant of the American Smelting & Refining Co, situated just outside of the city of Chihuahua, which was blown in on the date mentioned. Only one furnace was put in blast, but others will be added as things get into good working order, the effect of which will be most encouraging throughout the State, but more particularly to the districts east and west, which are tributary to the city of Chihuahua. But of more far-reaching influence than the starting of the Chihuahua smelter is that of the Greene-Cananea Copper Co., in Sonora. During the week closing July 18 three of the immense new furnaces of the Greene-Cananea were blown in, and others will be placed in commission as soon as ready. The effect of a renewal of operations by the Cananea company cannot be over-estimated. It removes a cloud that has been over the entire State of Sonora, and creates a feeling of relief in Mexico. It is stated that with the adoption of the caving system at the mines, with its 3000-ton concentrator, the use of fuel-oil where possible, and other improvements and changes instituted by L. D. Ricketts, the general manager, the Greene-Cananea Copper Co. will from this time forth produce copper at 8c. per lb. or less.

JUNEAU, ALASKA.

Coal Land Regulations.—Copper River Development. — Bering River Coalfield.

Local politicians and mine-operators are discussing the effect of recent legislation on the development of coal in Alaska. By an act of Congress passed in May of this year, it was provided that consolidation of claims is limited to 2560 acres, or 16 claims of coal-land. Any one having an interest in one of these maximum consolidations cannot acquire any more coal-land in Alaska without forfeiture of rights in both. This provision is intended to prevent the holder of stock in one large corporation from holding stock in another. Any combination in restraint of trade, either by way of ownership, operation, or selling of coal, is made illegal under pain of forfeiture of all rights to the Government. The law is made applicable both to individuals and to corporations, but infractions will be difficult to punish. Locally it is believed that the idea was to prevent the Morgan-Guggenheim interests from gobbling up too much of the coal resources of Alaska, but the immediate effect may be to discourage the investment of capital in any comprehensive scheme, such as seems to be necessary to make coal mining a financial success.

The development of the Copper River country is dependent upon the construction of the railroad from the coast. Rivalry between two competing railroad companies appears to have been ended for the present, and the only serious undertaking now under way is the railroad from Cordova to Abercrombie Rapids, whence a steamboat on the Copper river will connect with a landing on the Chittina river, the distributing point for the Copper river district and 160 miles from the coast. This scheme is backed by J. P. Morgan and M. Guggenheim's Sons. Of the Copper River & Northwestern railroad 27 miles have been built from Cor-

dova, on Controller bay, and 13 miles remain to be built to Abercrombie Rapids. The steamboat was transported in sections across the mountains last year, and will make the 110 miles from the Rapids to the landing on the Chittina, where a short length of rail will be run to the Bonanza mines. The owners of the mines participate in the railroad business. By a contract made with Harry Havemeyer, Norman H. Shults, and James H. Ralph, it is stipulated that the Morgan-Guggenheim syndicate shall accept ore offered for delivery at the landing of the Chittina in 1909, and pay for it, deducting freight and treatment charges, according to terms already specified. Thus the mine-owners are in a most comfortable position. Stephen Birch is superintendent. The ore is rich. There is said to be, already opened up, not less than $22,000,000 worth of 25% ore, estimating copper at 11c. per lb. The limestone-greenstone contact, in which these deposits occur, runs for several hundred miles, and two other promising mines have lately been discovered. Cordova, the terminal of the railroad, is three miles from the old cannery at Orca. From Cordova it is 110 miles to the Bering river coalfield, or 90 miles from the place where the railroad crosses the Copper river. M. K. Rogers planned to construct a breakwater at Katalla, but he abandoned the scheme on account of its cost. His connection with the Guggenheims was broken and he has now devised a scheme to send coal down the Bering river (26 miles) to Controller Bay, to a port on Kanak island. The U. S. Navy Department has tested the coal and found it to be as good for steaming purposes as the Pocohontas. It is much to be hoped that there will be no further delay in the systematic development of the coal and copper mines, for they will become the basis of profitable industry long after the rich gold gravels are exhausted, and will serve as points of departure in prospecting for gold-quartz veins.

BUTTE, MONTANA.

Parrot Copper & Silver Mining Co.—Reins Copper Co. Annual Meeting.—Development of East Butte Copper Mining Co.—Resumption of Work at Other Mines.

The Parrot Copper & Silver Mining Co., one of the Amalgamated subsidiary companies, has its greatest prospects in its new mine, the Little Mina, which, under the direction of H. A. Gallwey, is being developed into an important producer. The future of the Parrot mine itself is a problem, but the Little Mina is no longer so. It is opened by a shaft 1000 ft. deep, with three levels, at depths of 600, 800, and 1000 ft. respectively, and preparations are being made to sink the shaft 200 ft. deeper. At present mining is confined to the 1000-ft. level, where the vein, situated south of the shaft, has been opened east and west nearly 500 ft. On the west sill there is 160 ft. of ore, 4 ft. wide, giving an average assay of 3½% copper and 6 oz. silver per ton. To the east there is another body of ore about 170 ft. long and 3 ft. wide, giving about the same average assay, while another orebody on the east end is 100 ft. long and 18 ft. wide, giving an average assay of 4% copper and 6 oz. silver. A width of several feet shows 12 to 15% copper, but the whole body, 18 ft. wide, is broken down and all of it mined as second-class ore. The Little Mina is yielding about 150 tons of ore per day. A new auxiliary engine is being installed for the purpose of sinking the shaft to the 1200-ft. level, and a new permanent hoist will also be installed with a capacity of 500 tons per day, capable of working to a depth of 2000 ft. In addition to the development done by the Parrot Co. on the 600, 800, and 1000-ft. levels, the vein has been opened and worked in the Nipper on the east, and has also been opened by a cross-cut from the Mountain Con. mine of the Anaconda Co. on the 1200-ft. level of the latter mine, connecting with the 1000-ft. level of the Little Mina. The Mountain Con. lies considerably north of the Little Mina, while the Buffalo mine of the Anaconda Co. lies north and east. The Nipper adjoins the Mina on the south and east. Directly west of the Little Mina there are no producing mines.

The Reins Copper Co. stockholders, at the annual meeting held in Butte, filled the board of directors with Pittsburg men, with two exceptions: J. P. Reins and Glen Thompson of Butte were retained on the board. The Pittsburg men are Col. James M. Guffey, E. W. Marland, W. P. DeArmitt, A. P. Childs, Jr.; T. N. Bernsdall, George D. Prentice, John H. Galey, W. F. Johnson, and August Hartje. At the meeting 1,708,000 shares of stock out of 2,000,000 were represented. A report of the affairs of the company shows that $129,000 was expended in operating the mine and for new equipment, and that ore to the value of $20,000 was shipped last year. Operations were not carried on during most of the year, the mine being closed at the beginning of the financial panic. A special meeting of the stockholders will be held August 12 to vote on the proposition of issuing bonds to the amount of $600,000.

Robert H. Gross, the new president and general manager of the East Butte Copper Mining Co., has been in Butte the past 10 days familiarizing himself with the property and affairs of the company. He believes the company could make money even at present prices if it had a big concentrating plant. The question of building a concentrator is being considered, and the company will resume shaft sinking. The big three-compartment shaft, designated as No. 1 to distinguish it from 10 other shafts on the company's property, is more than 900 ft. deep, and it is to be sunk to the 2000 ft. point at least. When work was stopped the bottom of the shaft was in a fine orebody, containing a great deal of copper glance.

The West Gray Rock mine, one of the Butte & Boston producers, is developing surprisingly. On the 400-ft level a big body of ore was opened recently, and it is growing larger as mining proceeds. Miners say they are working on a vein 18 ft. wide and the ore assays 7% copper. The North Butte Extension Co. is paying off its debts and expects to be in shape to resume operations in a short time. The first claims to be paid off were those of the laborers for June and July. The Butte Central & Boston Copper Co. appears to have more difficulty in raising funds, and attachment after attachment has been placed on the property of the company until now it will require about $25,000 to pay off the claims. The Butte-Milwaukee Co. has received its new machinery, which was ordered last fall, and preparations are being made to resume sinking on the Colonel Sellers claim, on which a shaft was sunk 700 ft. deep before operations were stopped by the financial panic.

The North Butte Mountain Co., which owns a group of claims in the Butte & Bacorn district, has let a contract for sinking a 500-ft. shaft, and the Surprise Eagle Co. is also making arrangements to resume work on its property in the southern part of the city.

Prizes for Collection of Ontario Minerals.

A prize of $100 cash is offered by J. B. Tyrrell, mining engineer, of Toronto, for the best collection of minerals collected in the Province of Ontario during the year 1908 by any one not employed as a collector by a public institution or by dealer in minerals. The collection must contain at least 30 mineral species, and it is suggested that where convenient the size of the specimens should be 2 by 3 in. Each specimen must be labeled with the exact locality from which it was obtained, and the date on which it was collected. No specimen will be considered unless so labeled. A typewritten list of the specimens, with names of minerals and localities, in triplicate, together with a declaration stating that they were personally collected by the signer in the Province of Ontario in 1908 at the localities stated, with the post-office address of the collector, must accompany each collection. The collections must be addressed: 'Examiners, Tyrrell Prize, Government Assay Office, Belleville, Ont.,' and must be sent *prepaid*, on or before December 1, 1908. They will be opened and examined jointly by Prof. Wm. Nicol, of the School of Mining, Kingston, and Prof. T. L. Walker, of Toronto University.

If requested the collections will be returned, charges collect, as soon as possible after the prize is awarded.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Imported pebbles for use in tube-mills have finally been discarded by a number of Rand mines, and the pebbles falling out of the 'banket' ore on crushing, are used instead.

A level line is a curved line, the tangent to which is always perpendicular to a plumb line. A horizontal line is the tangent to the level line, at the point under consideration.

Wrought-iron riveted to cast-iron is liable to excessive corrosion through the formation of a galvanic couple. This action was proved to be one cause of the failure of the Tay bridge.

A wye-level, badly out of adjustment, will give absolutely correct results if the sum of the length of the back-sights, of any one circuit, be made exactly equal to the sum of the fore-sights.

The term 'Artesian' is now used by the U. S. Geological Survey to designate the hydrostatic principle by which confined waters tend to rise by virtue of the pressure-head due to the height of the water-column, irrespective of whether this pressure be sufficient to lift the water to the surface and produce a flow or not.

Liquid air has not been a success for developing power. The liquefaction of air to produce one gallon of the fluid requires an expenditure of energy equivalent to 28 hp., the average cost per gallon being about $1.76. Only about 2½% of the energy expended in producing the liquid air can be recovered when it is applied as a motive power in an engine.

Scale-forming materials may often be eliminated by the use of feed-water heaters. This is due to the fact that waters containing much calcium and magnesium carbonates when heated to the usual temperature in feed-water heaters (200-210° F.), gives up the excess of carbon dioxide that holds the calcium and magnesium carbonates in solution, and the latter are precipitated and removed before the water enters the boiler.

Brick walls may be rendered impervious to water by applying alternate washes of the soap and alum solutions. The proportions are ¾ lb. castile soap to one gallon of water, and ½ lb. alum to four gallons of water. The soap wash should be applied boiling hot and allowed to stand 24 hours before the alum wash is put on. Two to three alternate washes of each solution will probably be required. This is known as Sylvester's process.

Pintsch gas is made from high-grade petroleum distillate and is a fixed gas, which, when compressed, has an illuminating power six times as high as coal gas. Illuminating gas of ordinary composition upon being compressed precipitates the heavier hydrocarbons in the form of liquid or tarry products, materially reducing the incandescent effect of the gas. The peculiarity of Pintsch gas is its remaining fixed under a compression as high as ten atmospheres.

Sodium amalgam must be made with great care in a cast-iron retort, or in a mercury flask, adding the metallic sodium gradually in small pieces. The quicksilver must be perfectly free from moisture, else the sodium will be oxidized in decomposing the water, and will thus be rendered unavailable for amalgamating with the quicksilver. This will show why it would serve no useful purpose to add metallic sodium in the mortar in stamp-milling. The sodium would be converted into caustic soda (NaOH) at once on coming in contact with the water.

The water-gas system consists in the decomposition of steam at a high temperature by incandescent carbon, thereby producing hydrogen and carbon dioxide. In the presence of incandescent carbon, the carbon dioxide is reduced by taking up another atom of carbon, forming carbon monoxide. In practical working the reduction of the carbon dioxide to monoxide is never quite perfect, the unpurified gas usually containing about 3% of carbon dioxide, which may be largely eliminated by some system of purification. The gas, in the process of manufacture, passes from the generator to the carburetters, where it is enriched by means of crude oil or cheaper distillates; hence the name 'carburetted' water-gas.

Direct observations on the sun, for the determination of true meridian, have almost entirely replaced the method involving the use of solar attachments. Among the numerous advantages offered by the direct method are these: The field-work may be done without reference to a previously calculated position of the sun, and the reductions made at any convenient subsequent time, the time-observations being the only datum needed in addition to the instrumental readings. The solar attachment, besides being an expensive instrument, is a delicate piece of apparatus and easily gets out of adjustment. It is also difficult and tedious to adjust. The direct method may be used on partially cloudy days on which the early form of the solar attachment (the Burt) is entirely unavailable. The use of the solar attachment involves previous calculation and more separate settings of verniers, and hence introduces more chance of errors in manipulation. There is no doubt that the direct method gives more accurate results for an equal amount of care in the manipulation. On the other hand, the direct method is not so advantageous in places when it is desired to trace a meridian directly on the ground. The manufacturers claim that solar attachments may be used as auxiliary telescopes for sighting down steep shafts, but their usefulness for such a purpose is questionable, since they are commonly made with low magnifying power. It may be noted here that the following formula is best adapted for reducing direct observations, in that it allows all the computations to be made by one logmarithic operation:

$$\cos \tfrac{1}{2} Z = \sqrt{\frac{\sin \tfrac{1}{2} S \times \sin (\tfrac{1}{2} S - \text{Pole-dist.})}{\sin \text{Co-alt.} \times \sin \text{Co-lat.}}}$$

where S = Pole-dist. + Co-alt. + Co-lat.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Mining Stock as Bank-Collateral.

The Editor:

Sir—Two articles have appeared lately in the MINING AND SCIENTIFIC PRESS that have interested me greatly. The first was the communication from M. L. Requa, regarding the use of mining shares as bank-collateral. The second was T. A. Rickard's presentation of figures supplied by F. W. Bradley on the cost and production-record of the Bunker Hill & Sullivan mine. While these articles were not intentionally written with reference to the same subject, to my mind they both suggest, with almost equal weight, the value of properly presented mine-reports in the legitimate conduct of the mining business. Mr. Requa's communication also takes the point of view of an outsider in showing what is desirable to have in the way of information that will make mining stocks as useful as other properties of the same value, while Mr. Bowler's figures are a concrete illustration of what may be done to clarify the haze that usually surrounds the affairs of a mining company. To a certain extent, Mr. Requa's statements regarding the inavailability of mining securities as bank-collateral, require some explanation. The banker does not invest money, he loans it. What is imperatively required of a bank-collateral is a ready market. Next to that, of course, is its intrinsic value. I happen to know that in New York certain mining stocks like the Amalgamated are freely taken by the banks as security in spite of much widespread and bitter criticism of the methods of that corporation, and of the intrinsic value of the stock in proportion to the stock-issue. The reason for this is that dealings in Amalgamated stock are in large quantities, and there is seldom or never any difficulty in disposing of considerable amounts of it at the quoted value. I have heard it said that Standard Oil stock, of which the earnings are far superior to those of the Amalgamated, is considered far less desirable as collateral, the reason being that Standard Oil stock is dealt in only on the 'curb,' and usually in small quantities. Of course, the shares of a mining company, the value of which are properly verified, are just as good security as real estate, but if the shares are not widely known, and not marketable, they must be treated exactly as real estate; that is, they would be good security for a mortgage, but not for a demand-loan.

I believe investigation would prove that this state of affairs exists all over the world. South African gold-mine shares of good repute are considered gilt-edged securities in the London market, and those of many other mining companies, in all probability, also are. In this country, the shares of most large mining corporations are available if they are traded in on the New York or Boston exchanges or curb markets, in spite of the fact that many of the most prominent of these issues have shown wide variations in price. It seems probable that the average man who refers to the mining business has his eyes set on a certain portion of it. People in the Rocky Mountain region when they speak of mining are apt to refer only to precious-metal mining, meaning by that, mines engaged in the production of gold and silver. I have known people who actually had to stop and think before they were sure that the Standard Oil Co., the United States Steel Corporation, and the Colorado Fuel & Iron Co. are all mining companies. A vast number of people are interested in the shares of enterprises which have issued from one to five million shares of stock, representing investments either wholly fictitious or ridiculously small in comparison with the capitalization. This is a type of financing extremely common in the West. I venture to say that such corporations may be numbered by the thousand. A large number of people in thinking of mining stocks have in mind this kind of stocks, and sub-consciously place the real mine-stocks in such a different category that they assume them to belong to another business altogether. This kind of financing is essentially of the 'wild-cat' order. The lightning strikes one of them once in a while, and makes the capitalization good, but on an average, they are quite worthless from the banker's point of view.

Such securities are dealt in on a number of local exchanges in the West, such as those of Colorado Springs, Salt Lake, Goldfield, and San Francisco. These exchanges publish quotations, but the quotations are very often as empty as the properties they represent. You can sell a few hundred shares of a wild-cat for a few dollars almost any time, but when it comes to realizing a considerable amount of money from such securities, the man who has the stock for sale is apt to find that the price can be very easily depressed. Bankers and investors have discovered long ago that there are only two ways of establishing the value of the average mining-security. They must either make a private examination, or depend on the extent to which such securities are backed by financiers and by the public. In the case of the Amalgamated, and of a great many other companies, the securities are given a certain importance and strength by the names of the men who are publicly known to be interested in them. The actual value is not easily verified. The public is satisfied to guess at a value, or it takes it for granted. The above is, I believe, a fair representative of the state of mining-securities in the United States.

But since to every rule there are some glittering exceptions, we find that there are instances of mining companies which place before the public such information that any intelligent man may form as good an idea of their value as he can of the value of any other form of property. As examples of this, I may cite the reports of the Tennessee Copper Co., the Utah Consolidated Copper Co., and the Bunker Hill & Sullivan. These reports contain substantially the following information: first, the ore reserves developed in the mine; second, the record of ore mined for the year, and the output of metals realized; third, statements of construction-work com-

pleted, under way, or contemplated; fourth, costs of current operation of mines, mills, and smelters for the year; fifth, a balance-sheet showing the capital expenditures for various purposes to date.

Such reports vary considerably in their individual 'make-up,' but they all contain the above information. The reports of the Alaska-Treadwell and lately of the Bunker Hill & Sullivan, have gone farther. They show a complete record of the ore-production in considerable detail, for a period of years, or from the beginning of the enterprise to date, together with the operating-costs for the entire period. This information is exceedingly valuable and instructive, because it shows at a glance not only what the record of a property is, but what its tendencies are, that is, whether it has passed its zenith and is diminishing in prosperity, whether the costs are increasing or diminishing, and in general throws some light on the future as well as on the past.

The reports issued by John Taylor & Sons of London on their various properties also have this excellent feature, but they also contain what has been pointed out by T. A. Rickard as a vicious feature, namely, the procuring of money for construction and improvements not out of the profits but out of fresh shares issued by the company, and often sold at a high premium. I have attempted to point out in other communications that such expenses are really in the long run true operating-costs, and ought not to be charged to capital account, at least not altogether. The result of this system is that in the reports of John Taylor & Sons with regard to the Mysore mine, for instance, we find that certain important sums have been paid as dividends that really came out of the stockholders' pockets. But setting these considerations aside, a beauty of the reports is that they disclose these important facts, and the stockholder is furnished with information by which he can use his own common sense to put a price on his property.

What I believe to be the best statement of any with regard to the affairs of a mining company, is the one recently gotten out by Mr. Bradley and published in the MINING AND SCIENTIFIC PRESS of July 4. This statement is a presentation of a circular sent by Mr. Bradley to the stockholders of the Bunker Hill & Sullivan Mining & Concentrating Co., giving the following information: first, the present condition of developments in the mine with an explanation of how the ore-estimates are arrived at; second, a complete record of the output of the mine from the beginning, showing the recovery made, and the prices received for metals during various periods; third, it shows the cost of mining, of concentrating, and of plant for various periods and for the whole period; fourth, it gives the various conditions under which the ore was marketed, and the cost of marketing to the mining company by periods from the beginning of operations and for the whole period; fifth, it gives the future expectations of the mine, based upon experience to date, in the way of costs, prices, grade of ore, and ore available.

Such a statement is what stockholders want, and what they need. It shows with absolute clearness what may be expected of the property. If a property be honestly run for the money that can be made out of it for the stockholders, there can be no objection to issuing such statements, except that in enlightening the stockholders, rivals may be enlightened also. In the majority of cases reasons for secrecy are far-fetched, and are much more likely to cloak intentions on the part of the management to conceal records or transactions that they are ashamed of. It is among the objects of the Mining & Metallurgical Society of America to discuss such questions as it can to advantage with reference to matters of public policy connected with the mining business; and among the questions that have been thought of for consideration is this very one of what a mining company should report to its stockholders. I am glad that the engineers who have been foremost in issuing complete and satisfactory annual reports, like Messrs. Bradley, Channing, and Requa, are in the Society, and it is to be hoped that some day the Society will be able to recommend to the public a method of issuing annual reports by mining companies that will be generally heeded and that will have a beneficial effect.

J. R. FINLAY.

New York, July 16.

Diffusion as a Factor in Ore Deposition.

The Editor:

Sir—The paper entitled 'Diffusion as a Factor in Ore Deposition' by Lewis T. Wright, in your issue of June 20, is of unusual interest as an expression of a kind of criticism of which many current theories of ore deposits stand in need. In so far, however, as the author attempts to disprove the effect of Soret's principle in segregating the metallic content of molten solutions, I believe him to be in error in assuming a parallel between a process which may be observed in a slag-pot, and a process such as is conceivable in nature. The fundamental difference lies in the time-element. In the case of the copper-slag, no sooner has a differentiation taken place than solidification of the magma ensues, whereas in a process of nature this need not necessarily be the case. Let us consider the sequence of events in the instance of a molten magma at rest and in contact with solid rock. In the event that the aqueous content of the magma be sufficient it is generally conceded that the basic minerals will crystallize out first, followed by the less basic, and last of all the free silica. Under these circumstances, as Mr. Wright states, a concentration will take place according to Soret's principle, of which the maximum is a function of the temperature-ratio, and, should rapid cooling follow, the differentiation of the rock would be too slight to result in an orebody. If, however, the cooling be so gradual that the basic minerals alone crystallize at the contact, while the solute remains fluid, the equilibrium of the latter will be disturbed, and further concentration will occur with repeated crystallization at the contact. Thus can the effect of Soret's principle become cumulative and account, together with other factors which it is not pertinent to specify, for the formation of an orebody

at the periphery, but, according to the theory of their genesis, such deposits must be sought in coarsely crystalline rocks rather than in eruptive glasses or their artificial counterparts. The application of J. H. Vogt's theories may be open to controversy, but not the principles on which they are founded.

H. H. Knox.

London, July 9.

Cornish Pumps.

The Editor:

Sir—As my experience with Cornish pumps of late has been confined almost exclusively to an occasional glimpse of one at some abandoned mine, I am hardly in a position to discuss their relative merits or defects, but when I read such sweeping denunciation of all forms of departure from the beam-engine type as appeared in your issue of July 11, I feel that a few words might be said in justification of those who have chosen more modern appliances. I shall make no attempt to disprove the reliability of the type of pump now operating at Linares, as my figures would seem small in comparison to the years of service performed there. If a proven reward of years were all that is required of pumps, we would need no further reference as to the best type, but unfortunately the factors of first cost, adaptability to existing conditions, and efficiency, have to enter in. The factor of first cost is against all forms of Cornish pumps, as is also their adaptability. The best results from these pumps are obtained in pumping from a perpendicular shaft where there is a permanent pumping level. As to handling a sudden increase of water, there is no pump which has such a positive limit to its capacity. As I know of no record equaling that made in Spain, it seems to me that there is no better way of justifying modern practice, than the simple statement of the possibilities and limitations of the different types of plant now in use.

With the beam-engine Cornish pump, the steam acts directly on the pump-rod. In order to make use of the expansive power of the steam, it must be cut off as early in the stroke as possible. To accomplish this, as high a steam-pressure as the pump-rod will stand is applied at the beginning of the stroke, and is cut off at about one-third the length of the stroke. The weight of the rod, and the expansion of the steam, carry the stroke to the end, when it stops suddenly. If the speed of the pump has to be increased, it cannot be done by increasing the steam-pressure without endangering the pump-rod, so it has to be done by retarding the steam cut-off. This allows of less expansion, and greatly reduces the efficiency of the pump. If the speed of the pump be greatly increased, the sudden stopping at the end of the stroke causes 'water-hammer,' which is liable to wreck the water-column.

By the use of the crank-engine and fly-wheel, these difficulties are to a considerable extent overcome. With the heavy fly-wheel to absorb the surplus power, a higher steam-pressure can be used at the beginning of the stroke, and then cut off so as to utilize its expansive power. Being crank-driven the pump-rod starts slowly and stops slowly, thus avoiding the shock incident upon the sudden stopping of the stroke. From the different articles which have appeared in your magazine, it is evident that this improvement—and improvement it must be—since it has such obvious advantages, has many champions. The great drawback to both the above forms of pump is the heavy rods and beams, which not only make a cheap installation impossible, but as their inertia has to be overcome twice during such stroke, greatly decreases the pump's efficiency as a whole. As these moving parts weigh from two to six times as much as the column of water to be raised, this loss of power will be seen to be considerable. The direct-driven steam-pump overcomes this trouble, but the advantage gained is offset by the loss from condensation in conducting the steam from the surface to the underground pump-engine. This loss can be minimized by careful packing of the steam-pipe, but is present to a greater or less extent in all underground pumps. When this type of pump is constructed with compound condensing-engine, it gives a high efficiency. It throws a continuous stream, which makes a smaller, lighter water-column possible, as the pounding is avoided. Owing to the great number of different classes of steam-pumps on the market, one can be had that will fit almost any circumstances or conditions. It cannot be questioned that the steam-pump has the advantage in first cost, and adaptability, efficiency, and durability depend entirely on the choice of pump, and the care used in its installations.

The present practice in pumping is to avoid steam altogether, wherever electric power is available. The new electric-pumps now being installed at the Ward shaft at Virginia City, Nevada, are to cost $125,000. They are of the plunger type, with automatic poppet-valves, and will have a capacity of 1600 gal. per minute against a head of 1550 ft. Pumps of the same type have been tested and shown to have an efficiency of 90 to 93.6%, and a combined efficiency for both pump and motor of from 78 to 84.4%. The valves and wearing parts are all arranged so that they can be easily removed and replaced. The space which the pump will occupy is small, so that from any point of view a comparison between this style of pump and the old Cornish pump would not be to the advantage of the latter.

Sumner E. Brown.

San Francisco, July 20.

Slime Filters in Mexico.

The Editor:

Sir—In a recent number of the Mining and Scientific Press I note in the news items from Pachuca that the installation of Moore filters by the Compañía de San Rafael is given to your readers as putting an end to the rights of the Moore people *versus* Butters. It hardly seems square to the man in the street that the reading columns of a paper with such a standing as your own should set forth this class of information when there are a whole lot of us who are users of the Butters filter and have gone into the matter very thoroughly through counsel both in the United States

and here with results that apparently quite justify us in installing additional Butters filters. What do you think about it?

C. W. Van Law.

Guanajuato, Mexico, July 16.

[We have no opinion as to the rights of either contestant in the regrettable legal controversy over slime-filter patents. The opinion of our correspondent was accepted as a local interpretation merely, and has the interest which always attaches to a local point of view. That is worth knowing by both plaintiff and defendant. We have admitted matter to our columns advantageous, so far as mere publicity goes, to both parties, and we are ready to continue chronicling the results obtained by both without preference.—Editor.]

Divining Rods.

The Editor:

Sir—I would greatly appreciate a little information in regard to the so-called divining rod, or switch, and the apparatus for finding orebodies. No doubt you will laugh at such a request, but I am often surprised at meeting people credited with some sanity, who express absolute faith in this method of prospecting. Some years ago, in the Cripple Creek district, I had opportunity to watch the work of one of these so-called wizards, and noted that on each of the several occasions where the ore failed to materialize as forecast, it was due to the orebody being 'capped,' and that the ore did exist, as the instrument indicated, but that no idea could be given as to the depth necessary to go to reach it; simply that it was there. In a supposedly 'technical' paper, published on the Pacific Coast, appears an advertisement stating that gold-bearing veins can be absolutely discovered with the aid of this instrument, and correspondence with the firm elicits the statement that "all mineral discoveries made subsequent to the discovery of the Mizpah mine of Tonopah, Nevada, were made with this instrument." This statement is without doubt, very unlikely to be true, still it is believed by a number of people.

My reason for sending this letter is that I am frequently asked my opinion of the divining rod, and while I have no faith in it, would value opinions from others. It is a fact that there are disciples of this method of mining, and frequent ventilation of the truth is desirable to stop the expenditure of money which is constantly being made in following up this foolish practice.

Edwin S. Giles.

Rhyolite, Nevada, July 16.

Professional Ethics.

The Editor:

Sir—Your scholarly editorial, 'Professional Ethics Again,' in your issue of July 18, sets forth lucidly certain tenets often lost sight of, and constitutes a notable contribution to the literature on the subject. Much has been written concerning what the mining engineer should not do, but a clear statement seems lacking as to what he should do. What we expect of an engineer is that he shall have knowledge and experience in that particular branch of work; that he shall have been trained to observe; that he be a man of integrity who will shirk no trouble to obtain all possible facts that might assist in arriving at a just conclusion; that he will distinguish clearly between deductions based upon his own knowledge and such as are based upon information received, and will so report. If he make use of such information, then to the extent to which he uses it, he endorses and is responsible for it. On this point in particular we are apt to slip up. The statement of facts and conditions should cover the ground so completely that another engineer may deduce his own conclusion therefrom, even to an opposing one. One engineer may in his conclusions rely chiefly on one set of conditions, but another with larger experience may place a greater weight upon another set, both being duly and correctly represented. A report should be written out fully and completely, embodying in it all the ideas on the subject-matter *pro* and *con*, and then being sure that nothing has been forgotten it may be cut down and confined to such points as enter into discussion. Finally the engineer should cross-examine himself, on every sentence, and so far as the data will admit of definite advice this should be given in the most explicit manner.

Howard D. Smith.

San Francisco, July 22.

Slime Filters and Patents.

The Editor:

Sir—In your issue of May 16 there is a communication from Askin Nicholas in regard to compressed air being used for keeping the filtering medium in a slime plant porous. Not having seen the previous correspondence, I am at a loss to know the exact method Mr. Nicholas refers to and the date that he is trying to establish, but if he will look in the Transactions of the American Institute of Mining Engineers, Vol. 31, he will see that in 1900 I used air-agitation in combination with bromo-cyanogen treatment. The slime I was treating was so heavy that I could not get the solution to percolate, but after many experiments I hit upon compressed air, and it worked perfectly both for distributing the pulp uniformly and for keeping it porous during treatment. This application of compressed air was original with me at that plant, but I understand that others had used a similar process elsewhere some time before.

S. H. Brockunier.

Wheeling, West Virginia, July 14.

A sixty-six story building has been planned for the Equitable Life Assurance Co., to replace its antiquated structure on lower Broadway, in New York. The total height of the building will be 909 ft., or only 75 ft. less than that of the Eiffel Tower. The main part of the building will be only 34 stories or 489 ft. high, but will be surmounted by a two-section tower having 28 stories and a 4-story cupola.

The highest mine in the world is the Santa Barbara, Bolivia, South America, which is at an altitude of 18,000 ft. above sea level.

GEOLOGY OF THE MINING DISTRICTS OF CHIHUAHUA, MEXICO.

Written for the MINING AND SCIENTIFIC PRESS
By RUFUS M. BAGG, JR.

The literature upon the geology and mining industry of Chihuahua is extremely limited, although many brief outlines of its geological features have been published by mining engineers. Not only are systematic reports lacking, but no correct detailed geographic and geologic maps of this important area exist. Even the Government postal, telegraph, and commercial maps of Chihuahua are incorrect in many particulars. Recent developments of ancient mines known as *antiguas*, together with the discovery of new ore deposits of phenomenal richness, have resulted in the investment of large sums of foreign capital in the district. Consequently public interest in mining enterprises in the State rapidly increasing.

The history of mine development in Mexico dates from the conquest of the country by Cortez in 1520. Six years after the original battle which decided the future of Mexico, mines were opened in Guanajuato, and very rapidly thereafter mining began throughout widely extended portions of the country. Fortunately the taxes collected for Spanish revenue from these mines were recorded in the public documents, and these archives bear witness to the richness of some of the early discoveries. On October 4, 1823, Mexico threw off the Spanish yoke, and a Federal Government was instituted. Thirteen years later, Texas seceded, and the Mexican war resulted. Through her defeat Mexico lost to the United States almost one-half her original territory.

Chihuahua is one of twenty-seven separate States of Mexico. It comprises an area of 83,746 square miles, which is approximately that of Utah or Kansas. Its northern boundary adjoins Texas and New Mexico, Sonora and Sinaloa lie to the west, Durango on the south, and the State of Coahuila borders it on the east.

The city of Chihuahua was founded in 1691, and its subsequent growth was due to the opening of the famous Santa Eulalia silver-lead mines, 18 miles southeast of the city, in the year 1703.

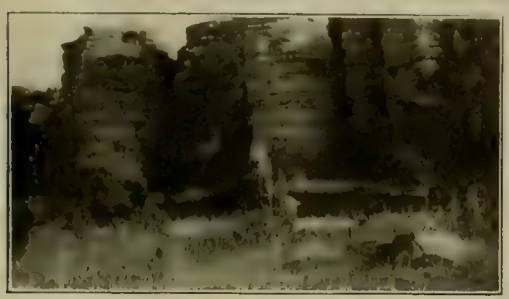
The surface relief of the State is divisible into two main types of topography, plateau and plain in the east and rugged mountains in the western Sierras. The Mexican Central railroad runs south to the city of Chihuahua, 226 miles from El Paso, on a line near the western plateau border. The general elevation of the plateau cannot be far from 5000 ft. above sea-level, and its average width in Chihuahua is about 100 miles. On the western side of the plateau the Sierra Madre rises abruptly and extends westward for some 200 miles, reaching over into Sinaloa and Sonora. Robert T. Hill describes* this eastern portion as belonging to one of the two great American deserts which he calls 'Chihuahuan,' the other being the 'Sonoran.' The latter includes part of Arizona and California, while the Chihuahuan includes portions of Coahuila, Texas, and New Mexico.

The plateau region of Chihuahua is broken by a series of low ridges and small mountains which lie east of the Mexican Central railroad, trend north and south, and cross the entire State. This eastern area is not as extreme a type of desert, if we except its northern and eastern portion, as is the Sonoran, which difference is believed to be due in part to its greater elevation. Stretches measured by thousands of acres are suitable for grazing, and what is said to be one of the largest cattle ranches in the world lies along the western border of the plateau, 25 to 30 miles in width, parrallel with the Mexican Central railroad. Until recently there has been little mining done in this belt. Twenty-five miles north of the city of Chihuahua, and thence eastward, there are, however, a number of promising silver, copper, and zinc properties in the Cretaceous limestone, which are being developed. The mountainous portion of the State is composed of late volcanic rocks belonging chiefly to the acid series. Rhyolite, trachyte, andesite, with various breccias and tuffs form the bulk of the ranges. These formations extend westward for nearly two hundred miles, reaching over into Sonora, where they constitute the eastern boundary of the Sonoran desert.

The Chihuahuan mountains are characterized by broad peaks and ridges, deep narrow canyons, and rough broken country into which the streams have cut gorges and carved out erosion-blocks of large dimensions. A typical view in the Sierra Madre is presented herewith, showing the contrast between timbered and barren areas. Such deeply eroded country is common throughout the western portion of the State, along the line of the Kansas City, Mexico & Orient railroad. The crests of the ranges have an altitude ranging from 7000 to 8000 ft. above sea-level. Nearly all this portion of Chihuahua is covered by heavy timber, some of it being of commercial value. A large portion of this belongs to the timber reserve of Mexico. Until recently it has been impossible to obtain concessions from the Government upon this forest reserve, although the remaining lands of the State have been for sale at a nominal figure. The rough broken topography of the country makes travel extremely difficult. The same rugged conditions must prevail throughout the Sierras elsewhere, for although thirteen railroads have built westward into them, only one road has as yet crossed the range. The Kansas City, Mexico & Orient railroad, one of the latest to make the attempt, is still in the heart of the mountains.

As the volcanics make the mountain region, so in Chihuahua the sedimentary series underlie the eastern plains. These are largely Cretaceous, and consist of limestone and intercalated sandstones which extend along the eastern and southern border of the State. The Santa Eulalia, Almoloya, Terrazas, and Coyame camps owe their prosperity to the deposition of ore in solution-chambers of these rocks. Under the undoubted Cretaceous beds is a lower series of rocks which is probably earlier than Cretaceous. This consists of an immense thickness of sandstone, shale, and limestone, dipping at high angles, and exposed for some 70 miles northwest of Parral to

near Ciénega de Olivas, a short distance east of the Conchas river. Near the base of the series is a bed of white conglomerate 60 ft. thick, standing nearly vertical, trending north and south, and carrying in one place across its entire width gold to the value of 80c. per ton. Fossils are very rare in these strata. A ride of three days over this area failed to show any characteristic fossils by which the age of the rocks could be determined. To the southwest, R. H. Burrows has discovered Jurassic forms, *Rhynchonella*



El Pilar, Sierra Madre, Chihuahua.

lacunosa and *Belemnites sp.*, which were found near the Lluvia de Oro mine, six miles from the Sinaloa boundary. W. H. Weed's section,* taken from Parral and extending southwest, failed to discover these sediments which are found northwest of Parral.

Directly west of the city of Chihuahua the Mesozoic sediments are cut off abruptly by volcanics, and the latter extend, as already stated, some 200 miles westward. On the extreme western border of the State, and far to the north of the Lluvia de Oro section just mentioned, shale and red sandstone

Balanced Rocks of Tuff, El Cajon, Chihuahua.

occur beneath thin-bedded limestone and limy shale. In the Sahuayacán district[1] these have been locally metamorphosed in contact with eruptive rhyolite and andesite. In some instances the alteration of the limestone has produced a garnet rock, one phase of which is seen at Terrazas, 25 miles north of Chihuahua City. Other samples of the same type of rock have been secured by prospectors in the Lluvia de Oro region. The western sediments are well exposed near the old village of Chinípas on the river

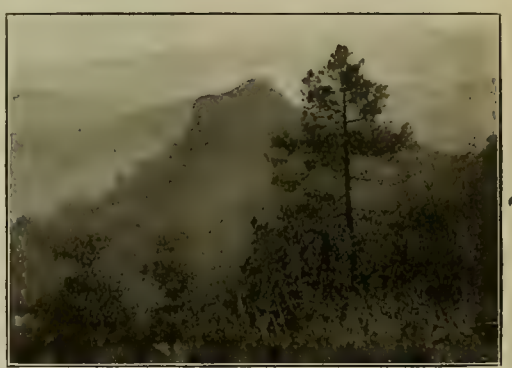
* Notes on a Section Across the Sierra Madre Occidental of Chihuahua. *Trans.* Amer. Inst. Min. Eng., Vol. 32, 1902, pp. 444-458 and plate.

1 Bagg, R. M., Jr., *Eng. & Min. Jour.*, Apr. 20, 1905, pp. 749-751.

of that name. In addition to these Mesozoic strata we find in the high Sierras two types of pyroclastics, of limited extent, filling erosion-basins. One of these is a fine-grained well-bedded tuff resembling sandstone. It is typically exposed in the basin of the Tomochic river half way between Ocampo (Jesus Maria) and Miñaca. These beds are the basin-sandstones described by E. O. Hovey.[2] There are also interbedded in this series layers of greenish-colored sands which resemble glauconite; but they are undoubtedly fresh-water deposits of late geologic age, since only unstratified tuffs overlie them.

The second type of pyroclastics occurring in this portion of the district consists of very coarse conglomerate masses in which the pebbles are frequently so large and angular that the rock is more nearly a breccia than a conglomerate. This formation is the 'Navosaigame' of Messrs. Hill and Hovey. These beds are poorly stratified and roughly sorted. They overlie the older volcanic formations and in turn are themselves buried beneath later rhyolitic and andesitic flows and tuffs.

Of far greater importance than the two pyroclastics just described is the unstratified tuff covering hundreds of square miles of the more elevated regions of the southwest portion of the State. The Navosaigame of Messrs. Hill and Hovey does not



Typical Scene in the Sierra Madre, Chihuahua.

appear to extend very far south of Ocampo and points west of them, while the tuff capping much of the country to the south of Ocampo is very extensive.

It is largely due to this deposit that the various mining centres in western Chihuahua are so widely separated. It is not that no ore exists between the mineral zones, but rather that the veins which do exist lie deeply buried from sight under this cap of tuff. The large number of mineral-bearing veins which have been found wherever the true volcanics occur leads to the inference that others may exist elsewhere below the surface-capping.

(To be Continued.)

An explosion of gas July 15 in the Williamstown colliery of the Summit Branch Mining Co. resulted in the death of seven miners and serious injury to ten others. The explosion is believed to have been caused by one of the men lifting the gauze of a safety lamp immediately after a shot had been fired.

2 *Bull.* Mus. Nat. Hist., N. Y., Vol. XXIII. Art. 18, pp. 401-448, July 26, 1907.

THE JOHN A. ROEBLING MONUMENT.

A monument to the late John A. Roebling was unveiled at Trenton, N. J., on June 30. The statue was erected by the Roebling Memorial Association, the expense being borne mainly by the citizens of Trenton and Roebling. The afternoon of the day was observed as a holiday, both in commercial and official circles, and fully 15,000 people congregated in Cadwalader Park to witness the dedicatory services and the unveiling. Preceding the ceremony, a parade of 6000 employees of the Trenton and Roebling plants, of the John A. Roebling Co. marched through the streets of Trenton to Cadwalader Park. The principal event of the day was the address of Henry D. Estabrook, general counsel of the Western Union Telegraph Co., at New York. The oration gave an interesting account of the life and character of Mr. Roebling, and is therefore reproduced in part herewith:

Those who knew him best affirm that the statue of John Augustus Roebling, which you, the citizens of Trenton, have here and now erected to his memory, is a true and faithful likeness. But it is more. Through some Promethian fire that flames once in a life-time in the heart of genius, the sculptor has "in this rough work shaped out a man."

I am expected by those having these ceremonies in charge to translate into words what the sculptor has so admirably expressed in bronze, namely, the type and quality, the idiosyncrasy of your famous townsman. But words are all too plastic for such a task. As if his nature had been subdued to what it worked in, the Ironmaster of Trenton was a man of iron. Iron was in his blood and sometimes entered his very soul—a man of iron, with the virtues of iron and the peccancies of iron to his account.

John Augustus Roebling was born in June, 1806, in Mulhausen, Germany, in the State of Thuringen. Mulhausen is an old walled town, founded in the year 800. The wall was really built to keep people out, though why anybody should want to get into Mulhausen is a matter of wonderment, after reading a description of it.

To a man like Polycarp Roebling, father of John Roebling, the prescriptive life of this old German village was by no means irksome. He kept a tobacco shop and managed to smoke as much tobacco as he sold. Smoking in Germany, you know, is a solace, whereas in America it is an employment. So Polycarp loved Mulhausen and lived and died there, in spite of his son's efforts to lure him to America. The mother differed greatly from the father in character and disposition, and John A. Roebling was the son of his mother. She was a woman of tremendous activity, mental and physical. Deep in her soul she nourished ambitions which became tragedies through very hopelessness. She had borne four children, three sons and a daughter, but it was not until her youngest child, John, had displayed mental qualities to distinguish him even in the eyes of strangers that there dawned upon her the full significance of motherhood. Thenceforth ambition had but one goal, life but one object—the education of her boy. Thus it was that John Roebling was enabled to graduate from the Royal University of Berlin, after a course at the Pedagogium of Erfurt; and thus it was that when, shortly thereafter, he sailed for America, he carried with him a patrimony large enough to insure his establishment.

John Roebling set sail for America in the year 1831, and landed on our shores a young man of 25, seemingly equipped for any battle that awaited him. He was a most accomplished gentleman. If a wiseacre had predicted his failure it would have been on the very ground that he was too accomplished, that his learning and talents were too varied ever to focus in a particular vocation—especially the vocation of a farmer, which he had deliberately chosen. Nevertheless he had chosen to become a farmer. He had graduated from the greatest university in the world as an architect and engineer. He was a scholar of wide reading; he was a philosopher of the transcendental sort, whom an American 'hustler' would shy at as a crank; he was a musician of rare skill and temperament; he was the master of three languages, German, French, and English; but what had all this to do with farming?

And yet he had chosen well, at least for the time being. In the first place his choice had led to a thorough study of American history and geography. His knowledge of the topography, climatic and political conditions, the advantages and disadvantages of the different States in our Union was as accurate as if he had personally visited every one of them. The reasons set forth in his diary for settling as he did are most convincing. In the next place, he forthwith invested all his money in desirable lands at cheap prices, thus preventing its dissipation in some visionary enterprise.

The lands selected by him were in the western part of Pennsylvania, Butler county, about 25 miles from the new town of Pittsburg. Here he and a few of his compatriots purchased some seven thousand acres at an average price of $1.37 per acre, and founded the village of Germania, afterward called Saxonburg.

I may as well admit that John Roebling never became a first-class farmer. He made a living, to be sure, but it was a meagre living, and if by good luck he got a little money ahead he was sure to give it to some German emigrant in worse plight than himself.

One day it occurred to farmer Roebling that he might patch out his income if, between crops and during the winter, he could obtain employment as an assistant engineer in making surveys, building canals and dams for slack-water navigation, and such like work that was going on in his vicinity. His services were readily accepted, his real merits were soon recognized, and it was not long before his knowledge and skill were in actual demand. Henceforth the farm was practically abandoned so far as John Roebling was concerned.

In his work around the canals he had long noticed the heavy clumsy ropes, made of Kentucky hemp, used to haul canal boats over the portage railways. They were costly and short-lived and a considerable

item of expense. John Roebling opined that if a rope could be made of wire flexible enough to be wound on a windlass, it ought to cost little more than a hempen cable and would possess greater tensile strength with one-fourth the diameter. Moreover, German ought to do in America. At all events the idea was worth a trial.

So he built a rope-walk on his farm at Saxonburg, purchased a quantity of wire deemed suitable for his purpose, instructed his friends and neighbors in

(*Wm. Couper, Sculptor.*)

The Roebling Statue at Trenton, N. J.

it would outlast a dozen ropes woven from vegetable fibre. No one in America had ever made a wire rope nor ever seen one. Roebling himself recalled an item in a periodical sent him from Mulhausen, to the effect that some German inventor had produced a wire rope, and he concluded that what an indigenous German could do in the fatherland, a transplanted the art of rope twisting, and actually fabricated a wire rope that surprised his most buoyant expectations. It was a remarkable achievement and almost made him famous. But he did not stop here. John Roebling's inventive mind evolved an idea, having its origin in a memory.

While yet a student at the university he saw for

the first time a bridge suspended by chains spanning a small stream called the Regnitz. He had studied this structure, sketched it, and made it the subject of a thesis. Now he recalled his youthful essay and bethought him that if a cross-river aqueduct were suspended from wire cables (so much stronger than chains) it would eliminate piers and posts and other obstructions and leave the river to flow at its own sweet will. He laid his plans and calculations before the engineers of a canal company about to cross the Alleghany river at Pittsburg, frankly admitting that what he proposed to do was without precedent, and in Germany would doubtless be frowned upon. But he insisted that his figures were correct and spoke for themselves, and that the advantages to be gained justified some risk. In short, that his scheme ought to appeal to the American spirit of shrewd adventure and daring enterprise.

He was ordered to do the work, and set about it knowing that the outcome would either place him in the forefront of American engineers or ruin him forever. The undertaking was a success and led to many commissions of like kind, several of these suspension aqueducts being still in use, unimpaired, and seemingly good for all eternity.

Now a layman can see that a suspension aqueduct is nothing less than a suspension bridge, carrying an enormous load. John Roebling recognized the fact and pondered it; the whole world knows the results of that cerebration!

Before he had completed his first suspension bridge over the Monongahela, Mr. Roebling realized that he must have shops and machinery and possibly mills for drawing his own wire, and he further realized that Saxonburg was not a suitable place for such a plant. On the advice of his friend, Peter Cooper, whose iron foundries were at Trenton, he visited this Quaker city, studied its advantages, purchased a quantity of ground, and in 1849 removed his family from Saxonburg here, the journey requiring seven full days—accomplished now in almost as many hours. Mr. Roebling was the architect of every building of his new plant, and the inventor and designer of nearly every piece of machinery that went into those buildings; for it was not until years afterward that he could be persuaded to employ an assistant engineer or draughtsman.

His planning of the Kentucky bridge, which was never built; the actual erection of the Wheeling bridge, the Cincinnati bridge, and even the wondrous bridge over Niagara Falls, were simply preliminary training for the monumental work that was to cost him his life while crowning it with glory.

When John Roebling presented his plans for the Brooklyn bridge the engineers of the whole world scoffed at them as audacious and absurd. If, said they, he should succeed in spinning his iron filaments over so vast a stretch, what useful purpose would he accomplish? Poof! Roebling's tangle of wire was a web to catch flies—he was courting the fate of Arachne in the fable! It was, in sooth, a work of unexampled difficulty; looming, portentous, titanic! He fought his detractors inch by inch for the right to try, defending his ideas with such vehemence and courage that finally this right was given him. The great work, begun by himself after his own designs, was completed by his son. It is called today, in the candid admiration of mankind, The Eighth Wonder of the World.

Originally planned for a calculated load with a margin of safety, the exigencies of traffic have long since burdened this noble structure many times beyond its promise; and yet, within the last few weeks the board of experts appointed to examine its condition report that it is safe and unhurt and, if possible, has grown stronger with use. Luckily for the people of New York, John Roebling's promise was always less than his performance.

But the Brooklyn bridge is more than a crowded highway; it is a thing of art, beautiful in itself. From the bedrock of a mighty river, one hundred feet below its surface, bastions of masonry leap toward the clouds and kindle in the distance like shafts of light. The tenuous festoon that seems to cling to them floats in the air—an incredible gossamer woven in a dream. Yes, Brooklyn bridge is beautiful! All the latent poetry of the mathematician—and in its highest reaches mathematics becomes divinest poetry—all the estheticism of the architect; all the musician's sensitiveness to harmony; all the mysticism of an idealist philosophy; whatever of faith, feeling, reverence John Roebling cherished in his heart, was here voiced like a ringing cry. As if conscious of his pending doom his genius stands embodied in this final form—an inspiration visible—a soul's bid for immortality!

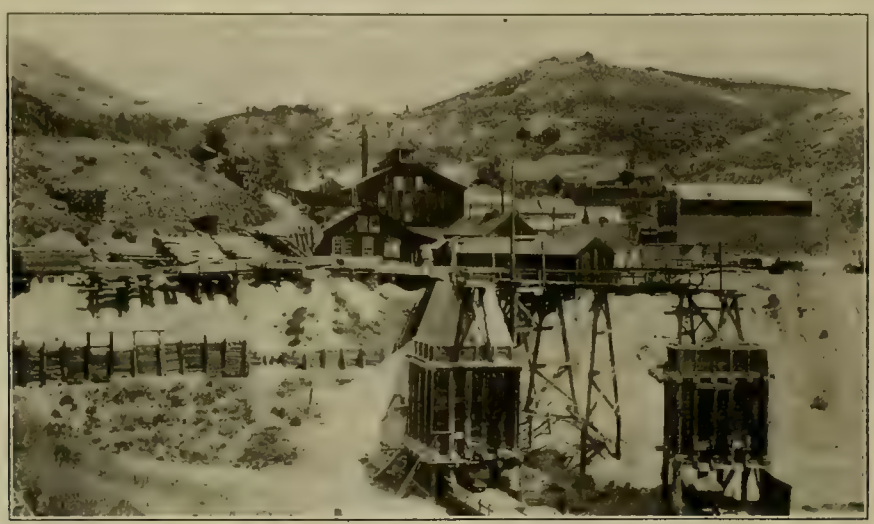
CINNABAR IN NEVADA.

American canyon drains the eastern slope of the Humboldt range and is about 26 miles south of Mill City. This mountain range trends nearly north and south, and American canyon takes an easterly course, being about three miles in length. The bed of this canyon was worked extensively for placer-gold from 1882 to 1900, the proceeds of these operations aggregating over a million dollars. In the course of this considerable cinnabar was found. It occurs in limestone at the contact of the latter with an intrusive diabase. This vein is well defined and spreads into the diabase to some extent. The cinnabar occurs in shoots, and the fact that nuggets of gold have been found in the lode-matter supports the belief that much of the placer-gold of the canyon came from this lode as it was eroded. The same lode can be followed into the bed of the canyon at its southeastern extremity. The northwestern extension of the lode passes into the hill and there outcrops high above the bed of the canyon. Following along the strike of the upper end of the outcrop for 1400 ft. a series of openings has been made, in all of which cinnabar has been found, occurring in a gangue of lime carbonate and quartz, said to average above 3% cinnabar. Cinnabar is also found on the western slope of the Humboldt range, occurring here in limestone and serpentine, in irregular bodies, and carrying from 2 to 4% cinnabar. This deposit is six miles south of Humboldt House.

YELLOW JACKET MILL, COMSTOCK LODE.

Written for the MINING AND SCIENTIFIC PRESS
By WHITMAN SYMMES.

The Yellow Jacket Mine, at Gold Hill, is the first mine on the Comstock Lode to attack the problem of low-grade mining. The mill was completed in February, 1908, and since then has been regularly treating about 180 tons per day. The management is attempting to solve the problem by simple concentration. The men in charge take the view that they can concentrate ore that assays as high as $8 per ton and leave less than $2 in the tailing, and they maintain that their $2 tailing cannot be cyanided at a profit. On the other side of this milling debate is Charles Butters & Co., Ltd., who have 20 stamps, two tube-mills, and a 250-ton cyanide plant in the canyon two miles below Virginia City. In March, 1908, this Company obtained leases on the Chollar and Potosí croppings, and has since been doing considerable work in opening up the two old surface-tunnels and their many drifts. Mr. Butters appears to be preparing to work ore that assays as low as $7. He must pay 18% of the bullion-value to the lessors, the usual 4% royalty to the proprietors of the Sutro tunnel, and also the local taxes. Therefore he will have to mine, mill, and cyanide for less than $5 per ton, in order to make a profit on $7 ore with 90% extraction. His work will be watched with a double interest, for it is understood that he will undertake to reduce expenses by cutting out concentration, with its attendant shipping expenses, as much as possible, and will substitute cyanidation of the sulphides. Low-grade mining opens new possibilities on the Comstock, and there is an immense tonnage awaiting a solution of the problem. The Yellow Jacket mine has a bullion-record of $19,000,000. The lower levels were flooded in 1882, and the mine was then worked in the upper levels for the lower-grade ore which had been passed by in the bonanza days. The water now stands a little below the 1400-ft. level, but the mine is not open below the 1100-ft. level. In 1906 H. L. Slosson and associates bought control of the mine on the Stock Exchange, and took over the management from the Morrow-Sharon interests. The latter gentlemen had previously held undisputed sway in Gold Hill, but they did not own the stock of the mines that they managed. The new owners are now working the low-grade ore in the out-croppings, and are preparing to work the 'gold vein' between the 1100 and 1500-ft. levels, until such time as the water is lowered and access can be had to the deeper workings. Before acquiring control of the mine Mr. Slosson had a verbal option on the Yellow Jacket dump, which was supposed to contain 200,000 tons that would yield a profit of $1 per ton; but the promotion missed fire. The mill has been placed convenient to the dump, and about 2000 ft. from the hoist; but silver has fallen from 70c. per ounce to 52½c., and the dump is not now so highly cherished.



Yellow Jacket Hoisting-Works, Gold Hill, Nevada.

Formerly Mr. Slosson sold Kinkead mills for Henshaw, Bulkley & Co., of San Francisco, and when he acquired the Yellow Jacket property he had the courage to swallow his own prescription—the mill he erected has twenty of them. The Kinkead mill at Goldfield has passed to the cemetery; and when Charles Butters & Co. leased the Kinkead mill in Virginia City belonging to the Best & Belcher Co., the operation was said to have been accompanied by

Interior of Yellow Jacket Mill.

costly repairs and extensive profanity. But the inventor seems able to keep his machinery in a better humor. The Kinkead Mining & Milling Co. began operating on the C. & C. dumps in Virginia City, and for several years past has been running without intermission on ore from the Ophir. The new type of crusher in the Yellow Jacket has also run for four months now without trouble. Mr. Kinkead superintends both of these installations. The Kinkead mill consists of a bowl, 40 in. diam., and an inverted mushroom for a muller. The stem is given a small eccentric motion, at 240 revolutions per minute; the ore is fed in through a hole in the centre of the muller, and discharges through screens on the periphery. The total weight on the muller, including the shaft, is about 5000 lb. The original claim for the mill was that it did not slime the ore; but there are considerable quantities of silver sulphide floating on the vanners when working the Ophir $30 ore.

At the Yellow Jacket the ore from the breaker is ground to 40 mesh in the mills, and is then classified into three parts, in home-made box-classifiers, one for each two mills. The concentrating room has 30 six-foot, plain-belt, Risdon-Johnston concentrators, in three rows, each row taking one size from the classifiers. In April 1908 the mill treated 4632 tons of ore assaying from $5 to $7 per ton, and extracted 178,000 lb. of concentrate. The value in the concentrate was 75% gold and 25% silver. The concentration was 52 into 1, and the extraction was about 70%. The tailing assayed from $1.25 to $1.86 per ton and the average was close to $1.75. In May 1908 the mill treated 5472 tons, and all but 750 tons was oxidized ore from the outcrop. One-third the value was silver and two-thirds was gold. The extraction by concentration was 68%. The concentrate generally assayed about $175, but one shipment went $579. The expenses of mining and milling were a little less than $18,000 or $3.30 per ton. Allowing for smelter-deductions, the cost was about $3.50 for a 68% recovery. The milling and concentrating cost about 75c. per ton, and the cost of shoes and dies, after selling the scrap, was between 12 and 16c. per ton. The cost of marketing the concentrate, including smelter-deductions, amounted to 54c. per ton of original ore. The breaker runs two 8-hr. shifts. The mill runs three shifts, with two men at a time at the mills and two at the concentrators. Mill foremen work one shift only. The mill and rock breaker averaged, by meter, 115 hp. for the month, at a cost of $5 per hp.-month. The mill cost when completed, $82,000, of which $8000 was expended for excavation.

There are three classes of ore in the mine, and unfortunately they are not equally susceptible to concentration. The sulphide-silver ores yield about 70%. The oxidized outcrop yields between 60 and 70%, and only 50% of the silver content is extracted. The 'gold vein' on the foot-wall, has practically no silver, and yields by concentration fully 80% and sometimes as high as 88. Each month the drop-boxes below the Kinkead mills are cleaned out and the sand is panned with quicksilver. About $1200 is thus obtained, which is nearly all gold. If the simple concentration-process adopted by the Yellow Jacket has any advantage, it is evident that it can hold that advantage only below a certain limit, which is determined by the cost of cyaniding. The Kinkead Mining & Milling Co., at Virginia City, is working $30 ore from the Ophir, using Frue vanners, without classification, and also a small canvas plant. The concentration is 33 into 1, and the extraction by concentration for six months has averaged about 71% on the mine-car samples, and 75% on the mill-pulp assays. The gold extraction was 84% and the silver 59, based on battery assays. The tailing assayed from $5 to $8 and were sold to the cyanide plant of Charles Butters & Co. The Yellow Jacket has not given the final solution of the problem of working the immense quantities of low-grade ore in the Comstock veins, but it is the first mine on the Lode to mine and mill its ore at as low a figure as $3.50 per ton.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

A. M. M., Millspaugh, California: Amphibolitic schist, derived from a basic igneous rock; shows some pyrite.

F. J. S., Goldfield, Nevada: Hornblende-andesite altered by carbonate waters that deposited metallic sulphides in the rock.

J. V. R., New Denver, B. C.: Highly altered rock, probably andesitic, decomposed by carbonated mineral waters and filled with calcite and pyrite.

W. C. R., Nashville, Arkansas: Thoroughly decomposed plutonic (crystalline) igneous rock, probably originally a gabbro.

W. S. S., Silver Peak, Nevada: No. 1, quartzite; No. 2, decomposed obsidian showing iron spots; No. 3, garnet; No. 4, obsidian, showing effect of earth movements.

H. G. G., Gold Circle, Nevada: No. 40, andesite, partly decomposed and leached of most of its iron; No. 41, pitchstone—volcanic glass; No. 42, nearly fresh andesite; small traces of a mineral looking like cinnabar were present but in too small amount to test; No. 43, nearly fresh andesite showing flow-planes; No. 44, andesite, altered and showing flow-planes; No. 45, altered andesite.

C. E. S., Sweetwater, Nevada: No. 1, missing; No. 2, quartzite; No. 3, schist, derived from basic igneous rock, probably andesitic tuff; No. 4, sericitic silicious schist, partly decomposed and filled with limonite seams containing traces of sulphides; No. 5, silicious schist with traces of sulphides nearly completely removed; partly stained with limonite; No. 6, impure mixture of iron silicate, limonite, calcite, and some silver; No. 7, biotite-andesite; No. 8, fluorite on quartz and stained with earthy oxide of manganese.

CYANIDATION IN MEXICO.

Written for the Mining and Scientific Press
By Francis J. Hobson.

In the early part of 1906 I made a number of laboratory experiments on silver-gold ores from the State of Sinaloa, Mexico. The results of these experiments demonstrated that silver could be successfully extracted from its ores by the use of a comparatively large amount of strong cyanide solution. A small leaching plant was erected, using filter-vats each having 10 tons capacity. The ore used in the experiments contained 15 oz. silver and 0.15 oz. gold. In order to secure an even leach it was found necessary to remove some 15% of its weight of slime, containing approximately 20% of the assay-value. The ore was crushed to pass 40 mesh. A 10-day leach, with 0.5% KCy solution, extracted 84% of the silver and practically all of the gold. The weight of solution used, in proportion to the weight of ore, was three of solution to one of ore. The strength of the solution was kept up to 0.5% for the entire period, and the cyanide consumption was about 3 lb. per ton. Ten pounds of the local slaked lime was intimately mixed with the charge before starting the leach. The gold and silver was precipitated from the solutions on zinc shaving. The separated slime was treated in the laboratory with various strengths and amounts of solution, resulting in a high extraction of the silver, when using four, or more, times the weight of dry slime of 0.2% KCy solution. The silver in the ore was nearly all argentite. The gangue contained 90% silica, about 2% iron pyrite, 0.5% hematite, traces of manganese as pyrolusite, 0.5% aluminum, 3% lime as carbonate, and no copper. As silver had not before been cyanided with any degree of success, I considered this application new, and almost equivalent to the invention of a new process. I am still under the same impression, and believe that successful cyanidation of silver ores in Mexico began with the installation of that small leaching plant. It was operated for several months, and several clean-ups were made, which checked closely with the estimates from assays. The precipitate was melted in a crucible, and a bar of bullion produced assaying 830 points fine silver and 10 points gold.

At that time I was in charge of a mill and pan-amalgamation plant that was extracting about 80% of the silver and 70% of the gold content, and ahead of the treatment we were losing about 10% in slime. I tried to persuade the company to change to the cyanide process, but they were afraid to make the experiment, regardless of the fact that I had proved by bullion-returns that it was good business to do so. The importance of the tests lay in the discovery that silver could be successfully extracted from its ores by the cyanide process (in the absence of base-metal interferences in the gangue) if ground sufficiently fine, by subjecting the sand to a leach, wherein the silver was brought in contact with 30 times its weight of potassium cyanide, and that silver could be extracted from the slime if the latter was agitated with 16 times its weight of potassium cyanide. In either case the strength of solution did not appear to be an important factor. To date I find this to be invaribly the rule, except where the silver occurs as chloride or bromide. In that case the proportionate requirement of cyanogen is much less.

In the year 1898, I installed a plant of 1000 tons per month capacity in the State of Durango, converting it from a roasting-hyposulphite-lixiviation plant. The ore was dry-crushed to pass 16 mesh, and leached in vats having capacities for one hundred 40-ton charges. The extraction was 77%, the resulting bullion being 940 fine silver, and 18 points gold. Finer grinding would not permit an even leach, consequently the low extraction, which was about equal on both gold and silver. In January 1899, I began building a slime-agitation plant in Durango, and had it operating in May of the same year. Here I had my first opportunity of practically demonstrating my 16 to 1 theory for silver extraction by agitation. The slime treated contained from 14 to 25 oz. silver per ton, and the plant-capacity was 7 tons daily. The charges, of about 2300 lb., were agitated four hours with four times their weight of 0.2 to 0.3% KCy solution, and 12 lb. slaked lime, and were then drawn into settling-vats. After settling, the solution above the charge was decanted into a clarifying tank, and another full charge of solution was added to the slime-charge under treatment. After its decantation, about 2500 lb. of wash-water was added, and this was decanted after settling. The decanted solutions were passed through zinc-boxes and returned to the upper sump-vat for re-use. Before treating, the slime was collected in settling-vats, from which it was removed to a large patio (yard) and sun-dried. This drying made the water-wash possible, reducing the mechanical loss of cyanide in the discharged residues. The chemical extraction in the agitation-period averaged about 92%. 80% of the extraction was recovered by the first decantation, 80% of the remaining twenty by the second, and 50% of the remaining four by the water-wash decantation, resulting in 98% recovery of the chemical extraction or silver in solution. The plant is still in operation, and the extraction by bullion returns, since the installation of the plant has been the same 90 per cent.

In the latter part of the same year (1899) E. A. H. Tays installed a successful plant for slime treatment at San José de Gracia, in the State of Sinaloa. In the early part of 1907, I tested ores and designed a plant, for another Durango company, that was installed and is still in very successful operation. A variation here from my previous practice was that of concentrating ahead of cyaniding. After concentration, the sand and slime are separated, the sand being leached, and the slime agitated with cyanide solution. About that time, Messrs. Corrigan and McKinney erected a 40-stamp mill with a cyanide annex at Concheño, Chihuahua. Concentration preceded cyaniding, and the sand and slime were treated separately. Difficulties were encountered in settling the slime, and solution is recovered from the treated residue by a special filter-press designed by Mr. Corrigan. In 1898 one plant in the Territory of Tepic, and another in the State of Michoacán, substituted cyanide solutions and zinc precipitation for hypo-

sulphite lixiviation on chloridized roasted ores. The Michoacán treatment was changed under my direction in 1901 to amalgamation, concentrating, and cyaniding the raw sand and slime separately. The change resulted in a slightly higher extraction, and a decrease in treatment-cost of $5 per ton.

In 1901, a 2000-ton per month plant was installed in the Territory of Tepíc, under my supervision. The ore is crushed in Bryan mills, concentrated on Wilfley tables, the sand leached and the slime agitated with cyanide solution. The silver recovery averages 88 per cent.

During the years 1900-01-02-03, several small plants were installed in the Republic by myself and others, for treating silver and silver-gold ores. The majority of these installations are commercial and technical successes. The ore treated with cyanide daily in Mexico, was at the end of the year 1903, about 500 tons. This refers only to those plants treating ores where the silver predominates over the gold content, in value. The most important application of the process since 1903 has been in the district of Guanajuato, where about 2500 tons of ore are being treated daily. This will be increased within eighteen months to 6000 tons, the installations now being under way. There are ten mills in operation, with capacities varying from 1000 to 1500 tons per month, most of them of my own design. The general practice in the camp is to crush, concentrate, and cyanide the sand and slime separately. Three of the mills, however, amalgamate the gold before concentration. The average total silver saving of all the plants is near 90 per cent.

During the period 1903-1907, a number of important plants were installed in the Republic. The Chas. Butters Co., is successfully operating a large plant near Panuco, Sinaloa; the Palmerejo Co., one in Chihuahua; the Real del Monte Co., a large plant in Hidalgo, and a number of other plants, of more or less importance, are operating in the States of Chihuahua, Jalisco, Durango, Sinaloa, Zacatecas, and Querétaro. Also a number of others are in the course of construction, the total tonnage now treated daily in the Republic being about five thousand. The adoption of the process has created a new industry in Mexico, as 90% of the ore treated by it could not be reduced profitably by any other known process. It has almost entirely superseded the patio and pan-amalgamation methods. Invariably a larger percentage of silver in the Mexican ores can be extracted by cyaniding, at from one-fourth to one-tenth the cost of amalgamation. This may seem like a broad statement but it is nevertheless true. The average cost per ton of cyaniding crushed ore in the Guanajuato district is about $1.25 and in some of the larger plants it is less than 75 cents.

In considering the adaptability of the cyanide process for the extraction of silver from its ores, the question arises as to the solubility of the various natural occurrences of the metal, and the physical and chemical characteristics of the material to be treated. The chief silver minerals are: the native metal and the sulphide, argentite; three species among the sulpho-arsenites and sulpho-antimonites, namely, proustite, or ruby silver; pyrargyrite, or dark-red silver; and stephanite, or brittle silver; the bromide and chloro-bromide, bromyrite and embolite; argentiferous tetrahedrite, containing sometimes as high as 30% silver as argentite; argentiferous galena, and blende containing silver as sulphide. The native silver is so slowly soluble in cyanide that practically no extraction from it can be obtained. Argentite is readily soluble, as likewise the chloride, the bromide, and the chloro-bromide. Proustite, pyrargyrite, and stephanite are sparingly soluble in cyanide solution, but are readily soluble in a solution of mercurous potassic cyanide. The extraction of silver by cyanide from argentiferous galena, tetrahedrite, and blende is a problem yet to be solved. Taking these facts as a basis, in the absence of irremovable chemical interferences caused by the presence of base-metal compounds in the gangue, silver can be extracted from ores where it exists in soluble form, if the physical structure permits of solution-contact with the contained argentiferous compound. The application of the process then resolves itself into:

(1) Grinding to the necessary fineness for solution-contact; maintaining the strength and quantity of solution necessary; and giving a preliminary treatment or in adding chemicals other than cyanide to the mill solution.

(2) The advisability of classification of the milled ore into concentrate, sand, and slime, or into sand and slime before cyaniding.

In the case of gold-silver ores it is often advisable and sometimes necessary to amalgamate the coarse gold before concentration or cyaniding. The most obstructive chemical interference is due to the presence of oxide or carbonate of copper. It is claimed, and in one or two cases has been proved, that cuprous ammonium cyanide as a solvent has overcome this interference in the case of gold ores, but as yet this remedy has not been demonstrated in silver practice. Preliminary treatment with sulphuric acid for the removal of the copper salts has been successfully applied. I am of the opinion that the combination of the two remedies will solve most problems arising from copper interference.

The one other important interfering base-metal salt, namely, ferrous iron (when existing in a form not removable by preliminary treatment), is readily overcome in mill-solution by adding mercurous chloride. Ferric salts and ferrous sulphate interferences are readily overcome by preliminary treatment with lime. Manganese salts, when occurring in sufficient quantities to cause trouble (provided they do not exceed 3 or 4% Mn), can be precipitated during the process of treatment by adding to the solution an excess of calcium hydrate. Aluminum interferences are controlled by adding calcium hydrate in excess. Soluble sulphides formed during treatment are neutralized by the use of lead acetate. In Mexican ores, we have not yet encountered base-metal salts, other than those mentioned, in sufficient quantity to cause trouble.

(*To be Continued.*)

STEAM SHOVEL IN COPPER MINING, ELY, NEVADA.

Written for the Mining and Scientific Press
By F. S. Pheby.

The steam shovel has been introduced in copper mining by the Nevada Consolidated Copper Co. at Ely, Nevada. Four shovels are in use, weighing 95 tons each, three working in overburden and one in ore. Shovels of 2½ cu. yd. capacity, now employed, will soon be replaced by shovels of 5 cu. yd. capacity. Recently one shovel, working 9 hours, handled 2800 cu. yd. Two shovels shown in the cut herewith are working in overburden. The man in the foreground stands on the rim of the ore pit, which is 22 ft. deep. The track shown is laid entirely on ore, by means of which the thickness of the overburden may be readily appreciated. It varies from 8 to 24 ft. Only a small amount of overburden has yet been removed; the entire amount to be cleared is nearly 3,000,000 cu. yd. and it is estimated to overlie not less than 15,000,000 tons of ore, having an average thickness of about 200 ft. On the left wall of the pit may be seen a drill in operation. Holes from 50 to 70 ft. are drilled for blasting. While the ore is exceedingly soft, and may be crushed in the hand when thoroughly disintegrated, shoveling is, nevertheless, materially aided by blasting. The overburden is greatly discolored by iron oxides, but only occasionally by copper. The line of demarcation between the ore and the overburden is as distinct as is that between a red and a white band. The cars shown are of 3¼ cu. yd. capacity, but are to be replaced by larger ones. Those carrying the ore to the concentrator have a capacity of 50 tons, twenty making up a train. The cost for handling a ton of material does not exceed 55 cents.

Steam Shovel Mining Copper Ore, Ely, Nevada.

DETERMINATION OF MOLYBDENUM IN WULFENITE.

By J. C. Evans.

*The following method has for its object the determination of molybdenum in wulfenite or other ores containing lead. The procedure consists in getting the ore into solution by the proper re-agents, the precipitation of the iron and lead as sulphides, the separation of molybdenum as sulphide, and its subsequent determination as lead molybdate, either gravimetrically or volumetrically. The method in detail is as follows:

From 0.5 gram to 5.0 grams of ore, depending on the amount of molybdenum contained, is digested in hydrochloric acid; nitric acid is afterward added and the treatment with hot aqua-regia continued until all soluble constituents of the ore are in solution; after one or two evaporations with nitric acid to expel all chlorides, the mixture is cooled, diluted with distilled water, and a slight excess of ammonia added. Ammonium sulphide is added, drop by drop, and when all the iron, lead, and other metals are converted into sulphides, a few c. c. excess are added, and, after stirring, the mixture is allowed to stand in a warm place until all the iron and lead sulphides have settled. It is then filtered, and washed with a solution containing a slight amount of ammonium sulphide. The precipitate is dissolved in a hot mixture of equal parts of nitric acid and bromine water, the iron and lead being reprecipitated by ammonia and ammonium sulphide to insure the removal of all the molybdenum. The combined filtrates, which show a deep brown color if much molybdenum be present, are slightly acidified with hydrochloric acid and a rapid stream of hydrogen sulphide gas is

*From the *Western Chemist and Metallurgist*, December 1907.

passed through the solution for a few moments. Theoretically, the addition of hydrochloric acid alone will precipitate all the molybdenum as sulphide, but I have found that the passage of hydrogen sulphide is necessary for complete precipitation. The molybdenum sulphide is filtered off and washed well with hot dilute hydrogen-sulphide water. The precipitate is then rinsed into a No. 2 beaker and a few c. c. of a hot mixture of nitric acid and bromine water are poured onto the paper, receiving the acid and washings in the beaker containing the bulk of the molybdenum sulphide.

The mixture is boiled with frequent additions of bromine to oxidize the free sulphur and to insure complete solution. From this point one of two courses may be pursued:

A. Gravimetric Method.—Any unoxidized sulphur is filtered off and, after careful washing, ammonia is added just to neutralization, using litmus paper as an indicator. A few drops of acetic acid are added, and then a slight excess of lead acetate, and the resulting lead molybdate, after stirring well and allowing to settle, is filtered through a tared Gooch crucible, or counterpoised filter paper as described by Blair (Chemical Analysis of Iron'), washed thoroughly with hot water and dried at 100° C. to constant weight. The weight of the lead molybdate multiplied by 0.2614 equals the weight of metallic molybdenum present, from which the percentage may be easily calculated.

B. Volumetric Method.—After the solution of the molybdenum sulphide, it is unnecessary to filter off any free sulphur present. The solution is almost neutralized with nitric acid, barely acidified with acetic acid, heated to boiling and, while hot, titrated with a standard solution of lead acetate, using a dilute solution of tannic acid on a spot-plate as an indicator. This is the well known method for molybdenum, and is the exact reverse of the Alexander titration method for lead. The solution at first gives an intense yellow color when a drop of it is added to a drop of dilute tannic acid on a spot-plate, and the addition of lead acetate is continued slowly until the yellow color just disappears. Knowing the standard strength of the lead acetate solution in terms of molybdenum, the percentage of molybdenum present in the ore is easily calculated. To prepare the solution of lead acetate, dissolve 15.70 grams of the c. p. Merck salt (it has been my experience that other brands frequently contain chloride) in dilute acetic acid, and make up to one litre. 25 c. c. of this solution is titrated against a standard solution of ammonium molybdate. The ammonium molybdate solution, having been standardized in terms of pure lead, shows the lead content of the lead acetate solution, and the lead factor multiplied by 0.4640 gives the molybdenum value. I have found this method more satisfactory than standardizing by means of molybdic acid, as it is very difficult to secure this re-agent free from impurities—especially molybdates.

Atlantic sea-water averages about 3.4% solid matter, of which 75% is sodium chloride.

UNDERGROUND AIR-COMPRESSORS.

Discussing air-compression in mines before the Institution of Mining & Metallurgy, Fearnside Irvine stated that the small compressor would have this advantage over a large one, that it could be worked as a single-stage compressor with very nearly the same efficiency as a large compressor could be worked as a two-stage compressor. It would deliver its air at very little higher temperature, if any, than the larger compressor would do, and that air would be delivered underground close to the scene of operations; whereas the air from the large compressor would have to be conducted down the shaft and along the levels and through the pipe lines. The object of the electrically-driven underground-compressor was to get past that point, and to compress the air close up to where it was wanted, so as to have the pipe-lines as short as possible, and therefore open to supervision and able to be looked after. There was another point in which the underground compressor had advantages, namely, that the generation of the compressed-air underground could be done at a much lower pressure than on the surface. If they took it that the surface compressor had to make air at 90 lb. in order to deliver it underground at 60 lb. they could easily put in an underground compressor near the work which could generate compressed air at 65 lb. and deliver it at 60 lb. through the short lengths of pipes, and they would therefore have the advantage of generating all their power at 65-lb. pressure instead of about 90 lb. The saving of horse-power in that case would far more than compensate for any loss in transmission.

The underground compressor, taking electric power at practically the same potential as a compressor at the surface, had the advantage of saving first of all the capital-cost of the pipe-lines, next the loss in pressure due to those pipe-lines, and was thus able to generate compressed-air at a lower pressure, thereby saving power all around. Some small air-compressors working on single-stage compression turn out compressed-air at about 220 to 230° F.

Small compressors, with small cylinders whose cubical contents bear a very much smaller relation to the cooling surfaces of the cylinder walls and ends than is possible in larger sizes, are, especially when single-acting, very efficiently cooled; their piston speed in compression is also very low. Take, for instance, a single-acting cylinder with 9-in. stroke and 10-in. diam., 300 r. p. m., cooled in jacket and head, the cooling surface would be 361 sq. in., the cubical content 706 = 1 sq. in. cooling to 2 cubic content. In a cylinder 48 in. by 22 in. diam. the contents are 23,000, the cooling surface 3312 = $^1/_7$.

Again, the speed of compression = at 75 r. p. m., 600 ft. per minute in the small compressor, 225; thus, the time in contact in the small cylinder = 2.6 times as long, and the surface is 3½ times as great = 9¼ times more cooling-effect. So far as efficiency is concerned, there is little difference between the two, and the small compressor working underground was a distinct advance upon the working of the large one on the surface.

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EDITORIAL.

Standardization of Mine Reports.

MINE reports incline to serve the function which a French wit assigned to human speech, namely, that of concealing truth. This appears once more in the jovial criticism from a Missouri agriculturist, published elsewhere in this issue. Like the proverbial Missourian, he 'wants to be shown,' but he also displays in a striking manner that human tendency which permits the report that does not elucidate to still allure. Mankind persists in taking risks in mining with the levity of a gambler's hope, instead of demanding evidence of a reasonable certainty of success. We do not answer Mr. Bowers' question whether he should "hold on". We do say, however, that when Mr. Bowers, or John Doe, or Richard Roe, chooses to gamble in mines, he is doing something in which those having the legitimate interests of the mineral industry at heart, can feel only regret. No possible justification can be offered for such gambling, any more than for playing at any game of chance for stakes. The principle is the same, and the influence on human character is the same. In short, it is not business. A man may win, but such winning does not mean success. It is not built up, and braced and tied together as is the fortune which comes from foresight and calculation. The point under discussion here is not the initial risk a man takes in prospecting and proving ground suspected to contain valuable deposits of ore. In a certain sense that too is a game of chance, but it is, or should be, based upon some plausible geological reasoning which inspires more than hope; in short, nothing less than faith. This great difference obtains; the man taking his chance on winning fortune from the earth is not playing against a trickster; his knowledge, his skill as an interpreter of phenomena, constitute his reliance, despite the many unraveled mysteries which obscure the processes of Nature. He does not throw in his money in blind hope that some power over which he has no control may see fit to so present or so misrepresent the facts as to cause a rise in the value of stock. The difference between the two kinds of adventure is of oceanic width. The safety and dignity of mining as a field for capital, even with the spice of adventure not wholly eradicated, is promoted by a rational auditing of mine accounts, and completeness of detail in mine reports. The extension of this habit will go far to eliminate the worst phases of the speculative evil from mining enterprises, particularly with regard to those which have been launched upon a career of productivity. The effort at standardization of mine accounts and the forms of annual reports will be useful if it do no more than awaken a better appreciation of the fact that there are bases of safety on

which sane investors may stand in mining as well as in manufacturing ventures. That complete calmness of judgment and clarity of vision will ever dominate mine flotation, save in rare cases, is perhaps almost too much to expect. The glamor of the thing will exert its hypnotic effect, and the clever promoter will continue to lead his willing victims to the sacrifice. Even in England, stronghold of financial conservatism as it is, and long accustomed to comprehensive and rational presentation of the conditions of mining enterprises, the 'wild-cat' is not an unknown animal by any means. Only a few weeks ago the grandees of London were offering premiums on stock in a company for developing a rival of the Rand in—Gloucestershire! The function of the certified accountant is not to correct evils of policy, but to vouch for the accuracy of the figures presented in the balance-sheet. Questions of policy are determined by the directors of a company, and the one that shall prevail must depend upon custom growing out of a healthy public opinion.

American Shipping on the Pacific.

A RECENT ruling of the Inter-State Commerce Commission requires railroads to publish rates applying to the rail-haul upon through shipments from interior points to over-sea destinations. The order has created excitement in many quarters, which is justifiable if it really mean that the American flag would in consequence disappear from the Pacific Ocean. That would, so reasons the man in the street, strike a blow at all the Pacific ports, and every industry would have some participation in the disaster.

The sentimental desire to sustain American shipping, because it is American and carries the flag, is praiseworthy. This sentiment indeed ought to translate itself into motives to effective action. One or two lines of steamships on the Pacific, floating the Stars and Stripes and losing money, demonstrate either that conditions are unfavorable or that the people have not paid enough for their sentimental pleasure in the spectacle.

Analysis of the specific case presented seems to show that the order of the Inter-State Commerce Commission has practically nothing to do with the proposed withdrawal of the Pacific Mail Steamship line. That order only requires publicity, and publicity means, of course, that the rivals of the Pacific Mail would enjoy equal advantages in railroad rates, but they would still labor under the disadvantage of being unable to offer through bills of lading to consignors. This in itself would be an impediment of serious import. But under the conditions of secrecy shielding the rates which the Pacific Mail could quote, that company lost in the last fiscal year $428,817. This covers a portion of a year of phenomenal prosperity. Deficits of such magnitude would speedily determine the fate of the company. Evidently it is ready to yield to Japanese competition, regardless of any aid which the railroads might lend. In fact, if there were any hope of profit in the business, the steamship companies could readily be taken on lease by the railroads, and thus avoid the dilemma of publishing a rate which would benefit a rival; the railroad could practically absorb all the income from such business.

The Japanese are masters of the situation, and we can no more hope to withstand them than we may expect to dominate trans-Atlantic shipping, until our navigation laws have undergone radical reform. We do not operate ships as economically as foreigners. That is part of the difficulty. Neither do we any longer operate them better. That is a sort of unction we may no more lay to our souls. If we did operate them better, we could drive the foreigner from the seas, as we did in the days of the famous Baltimore clipper-ships. Illusions may as well be dropped. The report of the Merchant Marine Commission in 1905 showed, as one example, the annual salary and wage lists of the Pacific Mail steamship *China*, of 5060 tons register, to be $38,106, against $32,508 for the Japanese steamship *America-Maru*, of 6307 tons. This difference is not enough to prove an insuperable obstacle to our ships. A very little advantage, such as through bills of lading would afford, easily could offset it. But the real trouble here on the Pacific, as also on the Atlantic, is the subsidy enjoyed by the foreigner. If we want our flag to float in the harbors of Tokio and Hongkong, we must invent some way of letting the American shipowner earn a living. We tried a mail-subsidy some years ago with the United States & Brazil Mail Steamship line, a line with beautiful ships which sailed empty, while its British rivals, with scrubby old boats, got the business. It is a painful memory, and somehow one cannot divest the mind of thoughts of the atrophy which is supposed to naturally follow any kind of parasitism. Why it does not work similarly with the foreigner is not readily answerable. At all events, our people do not like the thing called 'subsidy,' and perhaps we may never have it again. We could, of course, be rash enough to buy cheaper ships abroad, but we may as well confine our discussion to things that are possible. Free ships, after all the talk and tariff of so many decades, may be regarded as quite unthinkable. Discriminative duties favoring goods imported in American bottoms once gave us the mastery of the carrying trade of the world. It would do so again, if any Administration had wit and diplomacy enough to disentangle us from the meshes of some foolish commercial treaties, so as to set the hands of Congress free to legislate. Finally, each State has within its power the remission or reduction of taxes on American shipping, the abatement of port dues, and the regulation of other charges favoring vessels of domestic register. Many States have displayed enterprise enough to make some concessions of this nature, and such practical expression of sentimental joy in developing an American merchant marine has been responsible for some growth. But the favoring legislation has not been thorough enough. The State must extend its protection as far as it can, and the Federal Government must widen the opportunity by statutes as wise as those our forefathers enacted in the days when the Republic proved too weak to insist upon retaining its birthright.

Mining Claims on Forest Reserves.

LETTERS from officials of the United States Forest Service, which we are glad to publish in this issue, reveal that our statement on July 4 to the effect that titles could not be obtained to mill-sites on forest reserves is not true at the present time. According to the Use Book in force up to July 1, 1908, however, there was no instruction to officials relative to this matter. The new Use Book, issued on that date, from which our correspondents quote in refutation of our statement, had not reached us when our criticism was made. We had been convinced from previous conversation with leaders in the Forest Reserve movement that the policy of the Bureau was hostile to the patenting of mill-sites located subsequent to the creation of the Reserves, and it seems clear that the earlier Use Books contemplated the patenting of mineral land only.

The statement in Mr. Barrett's letter that "all (mineral) applications are examined by expert miners or geologists specially selected for the work" can have no general application. Mr. Hall, the Acting Forester, does not claim this to be the fact, and the affirmation is in conflict with reports which come from other sources. Mr. Barrett was manifestly drawing broad inferences from his own jurisdiction. The appropriation by Congress is clearly inadequate for maintaining such a force of trained men as would be needed to facilitate reports of the character called for in substantiation of the validity of mining claims over the vast area covered by the national forests. The Forest Service, which properly inclines toward resistance of every influence that might endanger the conservation and improvement of the forests, must continue to see its cherished purposes thwarted to some extent by encroachments made under a strict interpretation of the mining law, as it applies to Government land in the West. Illegitimate straining of the law for purposes disconnected with mining in its true sense is unfortunately easy, and its prevention unfortunately difficult. It lies within the scope of the supervision exercised by the forest officers not only to determine whether the land contains enough mineral to warrant its disposal under patent in accordance with the mining laws, but to ascertain whether a claim is valid, and whether the locator has shown reasonable proof of the existence of valuable mineral sufficient to constitute a 'discovery' within the meaning of the statute.

It is clear to anyone familiar with the geology of mineral deposits that the application of such rules is quite impossible except in extraordinary cases, even with the aid of geologists and expert miners, until there shall be further restrictive legislation on which to base decisions. The examination of a placer deposit is a costly matter, and manifestly the forest officials cannot ordinarily ascertain whether a claim is capable of economical exploitation. The examination by panning of samples superficially taken, as recommended in the Use Book, would be utterly inconclusive. A 'vein' has been so variously defined by the courts that any seam containing the slightest mineralogical divergence from the character of the enclosing rocks would answer the requirement, and no man could positively affirm in the great majority of cases that it might not lead into deposits of commercial utility. The summary of decisions on this point by Judge Hawley (Cook *v.* Justice M. Co., 58 Fed. 106, 120) states the difficulty involved in a most explicit manner: "In some mining districts the veins, lodes, and ore deposits are so well and clearly defined as to avoid any questions being raised. In other localities the mineral is found in seams, narrow crevices, cracks, or fissures in the earth, the precise extent and character of which cannot be fully ascertained until expensive explorations are made, and the continuity of the ore and existence of the rock in place, bearing mineral, is established. It was never intended that the locator of a mining claim must determine all these facts before he would be entitled, under the law, to make a valid location."

The granting of mill-sites presupposes the existence of grist to bring to mill. The advocates of national forests in the beginning desired a separate mining law, applicable to the Reserves, involving a return to the lease-hold system obtaining before the law of 1866. This fortunately failed of accomplishment. The principle of fee-simple ownership has become too firmly fixed in the habits and esteem of the people to be abandoned. But if the Forest Service is purposing to lessen the restrictions upon the acquisition of rights under the mining law, and to admit the application of that law on the same terms as upon other portions of the national domain, the way is being opened to operations which will necessarily be injurious to the forests. The removal of restrictions to the patenting of mill-sites is but one step in the inevitable recognition of the full liberty that may be claimed under the mining statutes. The development of mineral resources is necessary for national progress, but likewise is the preservation of the forests, in the vital need which exists for conserving timber and permanent water-supply. The spirit underlying legislation is, or should be, the attainment of the greatest good for the greatest number. There have been few movements in recent years that so completely gave expression to this utilitarian spirit as the national forest legislation. The depression caused throughout the California 'gold belt' every year from scarcity of water is an example of the need of such administration of the forests as will promote their development. The good which would follow from an extension of the working season of the mines along this zone would require phenomenal mineral developments in the Reserves to offer compensation for any further injury which might result to the forests on the watersheds. The chief danger, however, is not from legitimate mining, but from fraudulent application of the mining law to attain other purposes. It is evident that restriction by regulations, involving interpretation of the statutes by the Forest Service, is destined to fail. In that case remedial legislation would seem to be necessitated. Efforts to construe the existing law must inevitably lead in time to a contest which will bring forth a court decision that will pull down the barriers the Forest Service has been trying to erect.

Personal.

F. W. Oldfield is at Bannock, Montana.

S. F. Shaw is examining mines near Jimenez, Chih., Mexico.

Clarence Hamshaw, of New York, is at Fairbanks, Alaska.

H. C. Perring is on the staff of the Yukon Gold Co., at Dawson.

F. L. Ransome, of the U. S. Geological Survey staff, is at Rhyolite.

Frank H. Probert, of Los Angeles, was in San Francisco this week.

N. Samwell is examining placer mines in the Salween district, Burma.

George S. Binckley, of Los Angeles, was in San Francisco this week.

J. R. Finlay, of New York, has been in the Joplin district of Missouri.

Robert T. Hill has returned to New York from a professional trip to Mexico.

James F. Kemp, of New York, is making a tour of the western mining camps.

G. T. Coffey is hydraulic engineer for the Yukon Gold Co., at Dawson, Yukon.

R. H. Campbell, of San Francisco, was at Dawson lately and is now at Fairbanks.

Bertram Hunt has returned to San Francisco from Tuolumne county, California.

E. H. Messiter is now with the Robins Conveying Belt Co., at Passaic, New Jersey.

Ellsworth Daggett was in San Francisco this week and has gone to British Columbia.

G. L. Eddy has been appointed assayer at the plant of the Peyton Chemical Co., at Martinez.

R. H. Toll, of Denver, is examining mines in the La Plata mountains, in southwestern Colorado.

Robert Hanley has been appointed superintendent of the Mammoth mine, at Kennett, California.

E. E. McCarthy is superintendent of the dredging operations of the Yukon Gold Co., at Dawson.

Joseph W. Teale has been taken into the firm of Bainbridge, Seymour & Co., London, as a partner.

Oscar H. Hershey has returned from French Gulch, Shasta county, where he has been examining mines.

G. A. R. Lewington is advisory mining engineer to the North American Trading & Transportation Co., of Dawson, in the Yukon Territory.

S. Herbert Cox has retired from the firm of Bainbridge, Seymour & Co., London, to accept the Chair of Mining at the Royal School of Mines.

James E. Chapman, formerly at the Dolores property of the Guggenheims, is now at the Bonanza unit of the same interests, at Bonanza, Zacatecas, Mexico.

W. J. Adams, of the firm of Bandmann & Adams, mining engineers of San Francisco, has withdrawn from the firm, and his address is now 237 Sansome street.

M. W. Summerhayes has recently returned from a two weeks' visit to the property of the Compañia Minera Juarez, near Caborca, Sonora, where he was investigating the present cyaniding and reduction operations, with a view to increasing the capacity.

Dividends.

On August 4 the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 131, of $75,000. This makes the amount of dividends paid since January 1, $555,000, and the total to date $10,371,000.

Latest Market Reports.

LOCAL METAL PRICES—August 6.

Antimony	12@16c	Quicksilver (flask)	$45@45.50
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.95@ 5.90c	Tin	32@33½c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
July 31	13.06	4.50	4.67	52⅛
Aug. 1	13.12	4.50	4.67	52½
" 2	Sunday.	No market.		
" 3	13.12	4.50	4.67	52½
" 4	13.25	4.50	4.72	52⅞
" 5	13.25	4.50	4.72	52⅛
" 6	13.37	4.58	4.75	52⅜

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 30. £. s. d.	Aug. 6. £. s. d.
Camp Bird	0 13 0	0 12 6
El Oro	1 6 3	1 5 6
Esperanza	3 0 13 ex div.	3 3 9
Dolores	1 10 0	1 10 0
Oroville Dredging	0 9 0	0 9 6
Stratton's Independence	0 0 7½	0 1 0
Tomboy	1 3 0	1 3 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. July 30.	Aug. 6.
Amalgamated Copper	75¾	81
American Smelting & Refining Co.	88	94¾
Boston Copper	14⅝	14¼
Butte Coalition	27	29
Cumberland Ely	9⅛	9⅝
Dolores	7	7⅛
El Rayo	2	2¾
Giroux	3½	4
Greene-Cananea	12⅛	12½
Indiana Sonora	4⅞	5
La Rose	5⅜	5½
Miami Copper	8¼	9⅛
Nevada Consolidated	14¾	15⅜
Newhouse	6¾	7¼
Nipissing	7	7½
Ohio Copper	2⅞	2¾
Tennessee Copper	39¼	38¾
Utah Copper	39¼	42⅝
Yukon	4⅛	5¼

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, August 6.

Atlanta	$ 27	Laguna	1.10
Belmont	1.00	Manhattan Con	8
Booth	45	McNamara	67
Columbia Mtn	27	Midway	43
Combination Fraction	1.50	Montana Tonopah	1.50
Daisy	68	Nevada Hills	1.80
Fairview Eagle	40	Rawhide Queen	58
Florence	3.15	Sandstorm	35
Gold Bar (Bullfrog)	4	Silver Pick	25
Goldfield Con	5.97½	St. Ives	34
Gold Kewanas	40	Tonopah Extension	78
Great Bend	34	Tonopah of Nevada	7.72½
Jim Butler	27	Tramp Con	19
Jumbo Extension	56	West End	66

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. August 6.		Closing prices. August 6.
Adventure	8½	Isle Royale	23½
Ahmeek	85	Mass	7½
Allouez	39	Mohawk	69½
Amalgamated	80½	Nevada Con	16½
Arcadian	4¼	North Butte	84¾
Atlantic	15¾	Osceola	115
Bingham Con	50	Parrot	28⅜
Boston Con	14⅛	Phœnix	50
Butte Coalition	29⅜	Quincy	97
Calumet & Arizona	128	Rhode Island	4½
Calumet & Hecla	690	Santa Fe	2⅛
Centennial	30	Shannon	16⅛
Con. Mercur	42	Superior & Pittsburg	15
Copper Range	80¾	Tamarack	76
Daly-West	10¾	Trinity	18⅝
Franklin	13¾	United Copper Con	8⅛
Granby	106	Winona	7¼
Greene-Cananea, ctf	12½	Wolverine	143

General Mining News.

ALASKA.

(Special Correspondence).—An unusually dry season in the neighborhood of Nome is greatly retarding placer mining, especially among the smaller operators. Many immense ditch systems, now completed, have exhausted the small streams near the coast line. The Wild Goose, the Pioneer, and other big companies are discharging hundreds of men owing to shortage of water. This, and the fact that the placer mining is almost entirely controlled by the large companies, has caused almost a stagnation of business at Nome. A German tramp steamer sailed for Anadir, Siberia, on July 1, and took with her a number of American miners. The Governor of Siberia was recently in Nome and gave considerable encouragement to prospectors. All ground, except that of the N. E. Siberian Co.'s concessions, may be located and worked on 10% royalty.——A drill has recently been completed at Nome which is able to travel under its own power over the softest tundra marshes. The tires of the wheels are four feet wide.——Two big hydraulic lifts have been installed by the Fairhaven Water Co. on the Inmachuck river.——About 600 miners have gone to the Kougarok region since June 1, due to the recent strikes on the Macklin and other creeks of that district. ——The Universe Ditch Co. has begun hydraulicking on Glacier creek. A clean-up, the result of two days' run, was made on July 8 which netted $34,000.——A new placer strike is reported from Sinrock, where a miner named Cole has been shoveling in pay gravel for more than three weeks.

Nome, July 13.

ARIZONA.

COCHISE COUNTY.

The property of the Copper Belle Mining Co., at Gleason, was sold at sheriff's sale on July 28 to N. L. Amster, of Boston. The price paid, including the taking up of two mortgages, interest, and court costs, amounted to nearly $90,000. The first mortgage was held by John Gleason and amounted to $21,000. The property is a valuable one and has been worked by a New York company, which cleared $80,000 during ten months operations, and by the Shannon Copper Co.——The Tombstone Con. Co. is preparing to resume work on the Lucky Cuss property, which has been idle since last November, when the entire plant was destroyed by fire. The plant of the Toughnut property of the Consolidated is being moved to the Lucky Cuss and will be erected and ready to use within 30 days.

MARICOPA COUNTY.

C. T. Wolcott, of Colorado, has been in Wickenburg recently looking over the situation with a view to deciding on the location of a smelting plant.——The Chile mill of the Monarch M. & S. Co., nine miles southeast of Wickenburg, has started again. Fire destroyed the plant last year and thus retarded the operations of the company. The shaft is 150 ft. deep and has been in ore for the last 100 ft., which would indicate that the vein is at least 25 ft. wide.

PIMA COUNTY.

It is probable that the Helvetia Copper M. & S. Co. will soon blow-in its 150-ton furnace at its smelter at Helvetia. There are 2000 tons of ore on the dumps at the smelter and immense quantities blocked out in the mines. One hundred men are now at work.

PINAL COUNTY.

The Kelvin-Calumet Copper M. Co. will soon start the erection of a 500-ton concentrating plant at its property between Ray and Kelvin. The ore will be mined in open-cuts by steam-shovels.——It is believed that the Mammoth Collins property, at Schultz, will be sold to a syndicate of Baltimore people. The deal has been promoted by W. B. Twitchell, of the Kelvin-Calumet Company.

YAVAPAI COUNTY.

(Special Correspondence).——The Emporia Con. M. Co. has been recently incorporated to take over the Emporia property in the Groom Creek district. A new two-compartment shaft has been started and a head-frame erected. The shaft is 50 ft. deep, and has cut two veins, one lying against the foot-wall, which is 4 ft. thick and assays $12 to $14 gold per ton, the other is against the hanging wall, and is 8 ft. thick, assaying nearly $8. It is probable that a 10-stamp mill will be erected and possibly two Huntington mills added later. The mill-site is on Wolf creek, a distance of half a mile from the shaft, and will be connected with the mine by a tramway. A reservoir near the mill-site is now under construction. The Company is working 12 men in one shift. H. H. Keays is superintendent.—— The various properties of the Arizona Smelting Co., bankrupt, consisting of mines, stocks, securities, and a smelter at Humboldt were offered for sale at Prescott on July 25. The minimum price demanded was 75% of the appraised value of the properties. No bids were received and the announcement was made that private bids would be received at the law offices of Norris & Ross, said bids to be subject to the confirmation of the Court.

Prescott, August 1.

CALIFORNIA.

BUTTE COUNTY.

A forest fire last week destroyed the mill of the Cortez Mining Co., and the flumes on the property of J. G. Alm, both on McCabes creek, southeast of Enterprise.

ELDORADO COUNTY.

Another shipment of machinery for the Gold Hill mine, in Bear Creek district, arrived in Placerville last week.—— The Garden Valley Gold Mining Co., which recently purchased the Hume property, has begun development work on the claim, which has been named the Old Lady's mine. H. H. Hicks of Grass Valley is in charge of the mine.—— It is reported on good authority that the Zentcraft mine, in the western part of the county, which has long been closed on account of litigation, is soon to be re-opened.—— The mill of the Ritter mine, near Eldorado, has started, and is treating ore from the 200-ft. level. The mill is on Murray creek and the cars are lowered on a 700-ft. incline tramway to the ore-bins.

NEVADA COUNTY.

(Special Correspondence).—The New York-Grass Valley mine has been compelled to suspend operations owing to the turning off of water by the Blue Point M. Co. It is reported that the matter will be taken into the courts.—— Work has been resumed at the Morydena mine, and the 50-ft. shaft will be sunk deeper.——Arrangements are being made to enlarge the Blue Point ditch; 150 men will be employed. The ditch is owned by the New Blue Point M. Co., and supplies water for the Blue Point mine, at Smartsville. Work at the mine will be started this fall, according to present plans.——Sinking has been resumed at Midas. ——The South Yuba Water Co. has announced that it may be forced to deprive the local mines of water within 30 days. The company is using its reserve supply, and the continued hot weather, together with the absence of rain, renders the water situation serious.——It is reported that the Ironclad mine will shortly be re-opened and work pushed on a large scale. A new pump, compressor, and other machinery will be installed. A 20-stamp mill is under consideration.—— The Normandie group of claims, at Deadman's Flat, has been bonded by Santa Barbara and Eastern people. The consideration is said to be nearly $100,000. The Normandie shaft will be unwatered and sunk deeper and a new shaft will be started on the Dulmaine claim. Harry S. Abbott is general manager.——The Oustomah mine has reverted to the owners, following the failure of the Hayes brothers to exercise their option on the property. The owners will immediately resume operations, with Frank S. Morgan as superintendent.——San Francisco people have bonded the Dower mine, on Canyon creek, and are arranging to commence work. The property lies near the Marcotte.——The adit at the Kohler mine is to be pushed ahead with a large force of men. A new compressor will be installed. Frank McPherson is superintendent.——The English syndicate has secured an extension of their bond on the Champion

and Delhi mines until September 1. H. G. Torrence and associates are on their way to Nevada City from London to look after the interests of the syndicate.——The Giant King mines have passed into full possession of the Washington M. & M. Co. The company will erect an electric power plant to operate the properties. It is planned to install considerable machinery, including a 20-stamp mill. ——The Lecompton shaft has been unwatered to the 300-ft. level. A 12-in. Cornish pump is employed. As soon as the 500-ft. level has been reached active developments will be commenced.

Grass Valley, August 3.

PLACER COUNTY.

The Parmalee mine is being put in condition to be worked. Compressors and other machinery are being put in place.——W. A. Fletcher will install an electric plant on the North Fork of the Middle Fork, to run the mill at the Homestake mine, at Last Chance; the Paragon, at Bath, and the old Dardanelles, near Forest Hill. He has put more men at work at the Dardanelles, and will drive the Black Hawk adit ahead. The old tunnel run by Chapman is in 600 ft., and he expects to run 150 ft. farther to strike the channel.——Tom Harris has located on a big vein just across Bear river from Landers. The vein carries molybdenite, antimony, and galena.——A compressor is being installed at the Homestake.

SISKIYOU COUNTY.

The United States & British Columbia Mining Co., of Boston, has taken an option on the Wintering and the Osgood groups of claims, on Russian creek. By the terms of the agreement the purchasers pay $3000 cash and agree to put 12 men at work immediately. A total of $100,000 will be paid for a four-fifths interest, the owner retaining one-fifth.

TUOLUMNE COUNTY.

Ten stamps will be added to Driesam mill, and the shaft deepened 250 ft., making a total of 650. Twenty men are employed.——The Golden Eagle mine, near Confidence, has been bonded by W. H. Colburn and H. C. Parry, of Oakland, who will start development at once.——A cross-cut from the shaft at the 500-ft. level in the Omega has reached the vein. It is reported that the ore has been penetrated 20 ft., and no signs of the hanging wall.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Butts & Co., leasing on the Astor, broke into the old engine-room this week. It was always supposed that the room was on the 80-ft. level, but it now develops that it is on the 235-ft. level. A streak of ore had been followed for 70 ft., but where the old workings were struck the ore disappeared, being found 2 ft. to the east. The streak is from 8 to 10 in. wide and assays 1000 oz. silver per ton. This is considered the richest strike made in years on Democrat Mtn. There remains a vast area of virgin territory to be explored.——Work is to be resumed upon the Rover property, on Griffith Mtn. The property is owned by C. D. Turpin, of Rochester, N. Y., who is now in camp. The Rover is an extension of both the Aetna and the Comet.——A deal has practically been closed whereby the Lebanon group of mines and the Everett holdings on Republican Mtn. are to be consolidated. Work has already been put under way with W. H. Maxton in charge. It is the purpose of the management to extend the Lebanon adit several hundred feet, as a series of 39 veins is controlled, none of which have been developed below a depth of 200 ft.——The bond of $10,000 on the Gambetta group of claims, Republican Mtn., was lifted this week. A force of men was at once put to work in breaking ore and shipments will be started next week. A wagon road is being built to the portal of the adit. The drift on the Gambetta vein has been run for 190 ft. and a streak of $100 ore is exposed that is from 12 to 18 in. wide.——The Raymond adit is now in 950 ft., a lode having been intersected recently. The extent of the discovery is not yet known, as hanging wall has not been reached. Driving and stoping are under way upon the Paris vein, which was cut 800 ft. from the adit entrance, and a considerable amount of ore is being mined that is worth about $35 per ton in silver and lead. Joseph Raymond, of Georgetown, is manager.——J. McAdams has taken a lease on the Aliunde and is carrying on work through the Ocean Wave level. A winze is being sunk and a streak of ore is being followed that is from 6 to 8 in. wide and assays 425 oz. silver per ton.——Active work is now under way upon the Mollie Bawn, on Silver Mtn. The adit is being advanced and an immense orebody is exposed in the breast. This property is to be equipped with a small mill. H. C. Newton, of Denver, is in charge.——The Marshall-Russell adit has now been driven for 1950 ft., progress being made at the rate of 6½ ft. per day. Within 175 ft. the Neef vein will be intersected.——A rich strike is reported from the stope being made on the Cram vein through the Doric adit workings. The streak is from 6 to 10 in. wide and the ore shows some free gold. Assays show from 8 to 12 oz. gold per ton.——Shipments of concentrating ore from the Columbia mine, at Empire, are being made to the Newton mill, at Idaho Springs. Graham & Schlegel, operating under bond and lease, have a body of ore that is 3 ft. wide and worth from $12 to $16 per ton.——The Seemann tunnel, on Fall river, has now been advanced for 2111 ft. A new power plant is being constructed, the machinery being on the ground. The Seemann tunnel is to be driven under James peak and will be used both for mining and transportation purposes. Power is to be sold throughout the Alice-Yankee districts. Henry I. Seemann of Denver is manager.

Georgetown, August 1.

GILPIN COUNTY.

The Quartz Mill mine has been purchased by a company of Colorado and Iowa people, headed by O. J. Duffield, of Denver. The property is in Leavenworth gulch and comprises three claims. The main shaft, on the Quartz Mill claim, is 300 ft. deep. A good plant of machinery and buildings are already on the property and development will be started at once. J. H. Bawden, of Arvada, will have charge of the operations.——A good strike was recently made at the 300-ft. level of the Senator mine, below Black Hawk. A sample from a four-inch streak assayed $135 per ton in gold and silver.

LAKE COUNTY.

Christenson Bros., who are working the Pioneer adit near Granite, have opened a streak of ore carrying 15 oz. gold. Shipments will be made to the Leadville smelter. ——It is probable that a spur will be built from the Denver & Rio Grande to the Valley shaft, on Little Ellen hill, after which the rate of shipments will be greatly increased.

OURAY COUNTY.

The contract for the steel smelter-building at Ironton has been let to the Taylor Engineering Co., of New York. The Mono-Baltic Co. will treat not only the ore from its own mine, but will accept custom work. It is hoped the plant will be blown in early this fall.——Herzinger & Sigfrid have secured options on the old Fowler smelter and on several claims in the Gold Belt. The outcome of the deal depends upon the report of engineers who have examined the properties. If consummated the project means a revival of mining interests around Ouray.——The shifts on the Torpedo-Eclipse adit will be doubled as soon as the new boarding and bunk houses can be finished. The boarding house is now complete except for the modern plumbing system which is to be put in as soon as fixtures arrive. The lumber for the mill has been ordered and work will begin as soon as it is on the ground.——The Camp Bird Extension Co., owning 35 claims and several mill-sites in the Sneffels district, was incorporated last week under the name of the Amity Gold Mining Co., with a capitalization of $2,000,000, one-half of which is in the treasury. Extensive development work will begin on the properties immediately. G. L. Wright, of Ouray, is interested in the new corporation.

SAN JUAN COUNTY.

The financial affairs of the Gold King Mining Co., have been adjusted and the application for the appointment of a receiver has been withdrawn. A number of men have started work and repairs to the tramway and buildings will soon be started.——The Iron Magnet, near Chattanooga, owned by J. R. Curry, is being worked again this season. Some rich pockets have recently been uncovered and it is possible that a good mine may yet result. Mr. Curry is blind and the operations are directed by his wife.

TELLER COUNTY.

Negotiations are now pending and will be concluded within a few days for the resumption of operations on the Copper Mtn. cyanide mill owned by the Brockton-Alaska Gold Mining Co. Bull and associates, who opened up a large body of low-grade ore some time ago on the Flourine property, owned by the Montreal Mining & Milling Co., will operate the mill which has been idle for over two years. ——McLeod Bros. have secured a lease on the No. 2 shaft of the Anaconda holdings of the Mary McKinney Co., on Gold hill and will start operations immediately. A steam-hoist is now being installed.——The Taylor & Brunton sampler, at Goldfield, has been purchased by George E. Copeland and associates. Mr. Copeland has been manager of the plant since 1903 and as part owner will continue in that capacity.——The Mary McKinney Gold Mining Co. paid, last week, the first dividend in over a year. This distribution is at the rate of one cent per share and makes a total of $814,765 returned to share-holders.——James P. Wilson purchased last week from Cleaver & Sharp $1700 worth of mining machinery to be used in operating a lease recently secured on the Colorado Boss No. 1 on the south slope of Gold hill. The plant consists of an electrically-driven compressor, 8 by 10 geared hoist, and complete equipment. Active operations will be started as soon as the machinery can be installed.

IDAHO.

IDAHO COUNTY.

The shaft at the Buster mine has reached a depth of 390 ft. A cross-cut will be started at the 400-ft. point and it is hoped to reach the vein by September 1.——Richard Kleesattle has made the final payment on the Diamond group, near Dixie. It is said that active development will be carried on all summer and next winter and that a 20-stamp mill will probably be erected.

OWYHEE COUNTY.

The Banner mill, at Silver City, was formally opened recently. The equipment includes a 4-stamp battery of the Nissen type, a Blake crusher, Callow classifier, Wifley and Johnson tables, amalgamating pans, and other accessories. The mill is operated by electric power from the plant at Swan Falls, 30 miles distant, on Snake river, which is transmitted at a pressure of 22,000 volts.——The Silver City M. & M. Co. has been incorporated to work the Abel Berg property, in Long gulch, on the eastern side of Florida Mtn. The group embraces four claims and a mill-site. J. E Masters has been appointed manager.

SHOSHONE COUNTY.

(Special Correspondence).—The principal item of interest during the past week in the Couer d'Alene was the announcement that the Greenough Bros. have purchased the control of the Panhandle smelter on Lake Ponderay, together with large areas of iron deposits. It has been known for a long time that the Greenoughs have been anxious to place the Snowstorm mine, the big copper producer, on an entirely independent basis, and it was doubtless with this object in view that the purchase of the Panhandle smelter was made. The buildings for the roasters and machinery will soon be completed. The blast-furnace is being forwarded to the property and is all but ready for installation. It is expected that the plant will be in full operation within the next 30 days. Most of the ore to be smelted will come from the Montana mines and the plant will handle about 250 tons of ore per day, enough having been guaranteed to keep the plant in steady operation.—— A shipment of 25 tons of ore has been made from the property of the Gray Copper Co., at Osburn. This is the first shipment from the property and is of considerable significance to the large number of prospects working in that district. The ore shipped averaged about $80 per ton in copper, silver, and gold. It has been stoped from the sides of the shaft which was sunk on the vein, and the present indications for a mine are excellent.——As the result of a general appeal to the county commissioners the assessment on the big dividend paying mines of the district has been lowered about $42,000, apportioned as follows:

Federal M. & S. Co.	$13,500
Bunker Hill & Sullivan	10,000
Hercules	6,000
Frisco	5,000
Hecla	4,200
Gold Hunter	4,000

A rich strike of lead-silver ore is reported to have been made in the shaft of the Full Moon property. The shaft has been sunk 50 ft., and practically the whole face is in carbonate ore carrying stringers of a very high quality. The management has decided to run a long adit to get under the orebody. A large equipment of machinery will be installed at once. The adit will be 800 ft. long and will give a depth of 400 ft. under the shaft.——The Stanley mine, which has been closed since June, is to be equipped with a reduction plant this fall and the option on the New Jersey mill, which expired July 1, is to be given up. It is stated by Mr. Merk, the manager of the property, that the mine closed down more on account of the scarcity of water than anything else. The Company found the operation of the mill at half-capacity too expensive, and the experiment was sufficient to convince the management that on account of the antimony in the ore, amalgamation was not the best process available. The mine will not be started again until its own mill has been completed. This plant is expected to be ready in about 60 days and the Company is now waiting for the settlement of its suits with the Hercules, by which they seek to restrain that Company from dumping its tailing on the patented land of the Stanley above the mill-site. The new plant will consist of tables, rolls, jigs, and will have a capacity of from 40 to 50 tons per day.——The Schulz Mining Co. has been incorporated at Wallace and will operate a group of seven claims adjoining the Wonderful and the Bullion.——The Temple mine is reported to have struck galena in a shaft which is being sunk to determine the position of the vein. An adit will be run at lower depth to tap the orebody when its position is ascertained.——The capacity of the famous Bunker Hill & Sullivan mill at Wardner is to be doubled. Work has been commenced on the erection of a 1000-ton plant, and it is expected that the first unit of 50 tons will have been completed by the end of November or the beginning of December. All the grading has been done with the aid of a steam-shovel, and it is expected that the improvements will cost in the neighborhood of $80,000. The mill will be situated about 400 ft. south of the present mill and 700 ft. from the portal of what is known as the Kellogg tunnel on the O. R. & N. railroad track. The foundation for the mill will be of concrete. Much of the machinery has already been ordered from the East and includes crushing rolls, jigs, classifiers, Wilfley tables, and Card concentrating tables. Electric power for the mill will be furnished by the Washington Water Power Co., of Spokane. The output from the mine will be handled by the new mill, and work will be commenced at once to remodel, overhaul, and bring the old mill up to date. New machinery will be installed, and when this is finished both the mills will have a capacity of 2000 tons per day. Originally the old mill was supposed to have a capacity of 1000 tons per day, but the Company has been crowding it with 1100 tons in a satisfactory manner. Only one shift of eight hours is worked in the mine and this is enough to keep the mill running 24 hours per day. At present 550 men are employed in the mine, mill, and on construction. The ore now being taken out assays 14% lead and 4 oz. silver. There is practically no zinc in the product.

Wallace, August 3.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—A new producer was this week added to the Galena field. The development work has been completed by the Hartford Co., which has been doing extensive prospecting the past year. A number of shafts were sunk and sufficient driving done to open up the orebody necessary to supply a 300-ton mill, which has just been completed. Active operations will be begun at once and will add materially to the output from the Galena camp. A second shaft is being sunk near the mill.——One of the richest mines opened in this camp is the Rains, Sapp & Moore property west of the Century hotel. As development progresses the ore increases in richness. This find disproves the belief that all the ore had been worked out in this city, as this property is situated in the very heart of Galena.——In the Baxter Springs camp ten plants are either producing or doing development work. The Mission mine, after a brief shut-down, is again producing and getting ready to begin the construction of the new mill. A new shaft will be sunk.——The Hawkeye mine has been closed down temporarily to install a large six-inch Scranton pump. This will make a duplicate pumping system. Other improvements and repairs were made during the shut-down. ——The Chicago-Quapaw mine is again working on a new shaft, on the Julia Stafford 'forty.' Driving is being done preparatory to building a new mill the latter part of the summer.

Galena, July 25.

NEVADA.

ESMERALDA COUNTY.

The flow of water which impeded operations in the Mitchell & Fairfield lease on blocks 7 and 12 of Combination, has been reduced to small proportions and sinking is proceeding rapidly. The shaft is now down 390 ft. and will go to the 500-ft. point unless payable ore is found before that level is reached.——The old Waverly lease on the C. O. D. has passed into the hands of Heslip & Jeffries. They will begin work some time next week. Several veins of low-grade ore were uncovered by the former leaseholders. The shaft is down 300 ft. and the property is equipped with a fine plant of machinery.——It is reported that the Pactolus mines, east of Luning, have been sold to Eastern people for $65,000, and that big machinery is to be installed at once.——The old Queen lease, on the Florence ground, will be started again, and will be known as the Zinn-Florence. There is now a 400-ft. shaft on the lease, equipped with a hoist, and prospects for a good production are bright.——The contract for building the railroad to Rawhide has been transferred to E. W. King. Fifteen of the 25.6 miles have been graded and are ready for the rail-laying. The water company will have its supply at the camp within 60 days. Water will be supplied at 2½c. per gallon.——The Goldfield Syndicate Mining Co., which owns a one-half interest in the Rogers-Syndicate lease, has purchased the Nevada Rockland mine, near Pine Grove. The property was equipped with a mill by Eastern people who worked it last year on a bond.——The Grut Hill mine, at Rawhide, shipped a carload of ore-screenings that averaged $440 per ton. Two more carloads of similar ore are ready for shipment.——The mines of Goldfield produced during the week ending August 1 a total of 1772 tons, estimated to be worth $221,950. During the same period the Tonopah mines produced 6065 tons, of an estimated value of $156,175.

HUMBOLDT COUNTY.

Machinery and equipment have been recently purchased to increase the operations on the Vaile & Bullen lease on the Rosebud. This lease is working two shifts on the east and west drifts of the 100-ft. level, and good orebodies have been developed.——The Nevada Humboldt Electric Power & Light Co. has been incorporated. The capitalization is 1,000,000 shares. Power will be derived from Clear creek, in Humboldt county. It is the intention of the Company to supply power to all the camps of the Seven Troughs district. L. H. Rogers is president of the Company. The water-right will develop about 1500 hp. at the lowest stage of the stream.——The Sheba mine, near Mill City, which has been closed down for a year, is soon to be started up again with a large force of men.

NYE COUNTY.

J. C. McCormack and associates have purchased the Clifford group, nine miles from Stone Cabin. Water rights and a mill-site are included. It is reported that assays run as high as $4316 in gold and silver. The consideration is not stated.——A body of $100 ore has been uncovered at the 66 lease on Ladd Mtn. The ore was found in a cross-cut which is being driven to connect with the bottom of the winze.——It is reported that the Rose Gold M. & M. Co., operating a mile and a half south of Curry's well, will put in a mill and machine-drills.——The miners of Rhyolite have decided by popular vote to accept the Tonopah scale of wages.

LINCOLN COUNTY.

The Philadelphia-Searchlight, after being closed down less than a week, has resumed. The close-down was caused by a misunderstanding as to the securing of a loan.—— The new air-compressor that has recently been installed at the Mandha property, at Pioche, is now in operation, and T. J. Osborne says that the first test was most satisfactory. Shipments from this property are scheduled to begin in the near future.——The Golden Prince Mining Co., recently incorporated, has shipped supplies to its property near Pioche, and will push operations.——A new pump and hoist are being installed at the Shannon Bells M. Co.'s property at Eldorado canyon. As soon as this machinery is in place the main shaft will be sunk as rapidly as possible. A cross-cut is being started from the 90-ft. level, which is at the water-level, to tap the main vein. A new shaft is being started on the vein, which gives good assays.——The Pioche-Mohawk is asking for bids for sinking a 125-ft. shaft on one of its claims. A Buffalo whim and other supplies are on the ground and will be used as soon as the contract is started.——The Baltimore started sinking on its 500-ft. shaft the first of this week. New hoisting machinery has been erected.——The Nevada-Utah Mines & Smelting Co. have resumed the schedule of two trains per day on their Jack Rabbit run. It is now necessary to supply water for two sets of boilers recently put in at the Onondago mine, and the shipments of ore from the Day mine commenced this week.

NEW MEXICO.

The Pan American Federal S. & R. Co. will build a 100-ton smelter at Socorro. The citizens of the town have subscribed for $10,000 of the total cost of the plant, and have also furnished the site on which it is to be built. It is claimed that the construction will be started by August 15. The same company is building three other smelters; one at Lordsburg, one at Van Horn, Texas, and a third at Nogales, Arizona.——The Copper Gulf Mining Co., and the Comanche Mining & Smelting Co., have been merged into one company having a capital stock of $2,000,000. The new Company will probably be called the Copper Gulf Mining Co., and will have 4000 acres of mineral ground in the vicinity of Silver City, mostly developed, including the famous Pinos Altos mines, formerly opened by Senator Hearst. The Comanche has a concentrator and smelter at Silver City and a railroad from there to Pinos Altos.——A strike of rich ore is reported from the Mamie claim at Oro Grande. The whole shaft is in ore and assays run from $20 to $175.

UTAH.

BEAVER COUNTY.

It is reported that the Majestic Mines Co. will resume work at once at its Harrington Hickory mines. This property is one of the most valuable holdings of the Majestic, and has a record of a large production.

JUAB COUNTY.

The Victoria mine at Tintic has resumed the shipment of ore and is now sending out two cars per week. This will soon be materially increased when the new smelter can handle a large tonnage.——Following the policy which has been in vogue at several of the older mines of the Tintic

mining district for some time, the management of the Yankee Consolidated has decided to try the leasing system, and at least a half dozen leases will soon be in operation on the several upper levels of the property. In the meantime the Company will continue the development and extraction of ore from new territory.——The claims of the old Martha Washington Mining Co., near Silver City, have passed into the hands of Jesse Knight and will become a part of the Dragon Iron Co., the corporation which was recently formed to take over the old Dragon Iron mine and other adjoining territory.——The dissolution of the Juab Mining Co. and the Plutus Con. Mining Co., the former with a capital stock of $250,000 and the latter with a capital stock of $300,000, will mean the formation of a new company which will take over the groups of claims of these two Companies and some other adjoining territory. The Juab and the Plutus are old companies under the control of Jesse Knight. The first distributes among its shareholders assets valued at $13,800, and the latter $30,000. The ground owned by the Companies is upon the ridge to the southeast of Eureka. ——The burning out of three generators at the plant of

Map of Utah.

the Utah County Power Co. left the Knight mines without power last week and resulted in the temporary closing down of the Crown Point and the suspension of work in the new shaft of the Sioux Con. The damage has been repaired and work is now going on as usual.——A rumor has been in circulation here to the effect that the Crown Point Co. will install machinery and be independent of the Colorado.

SALT LAKE COUNTY.

The United States S., R. & M. Co. is operating its lead smelter, at Bingham Junction, on an oxidized charge in two furnaces, and a third is likely to go in by the end of this week. It is expected that three more will be operating on sulphide ore by the middle of August. The plant is equipped with six lead furnaces, each of a capacity for 300 tons of ore per day.

SUMMIT COUNTY.

The zinc concentrating mill of the Grassalli Chemical Co., at Park City, has been closed for the purpose of building an addition to the plant and providing equipment to treat a larger tonnage. The company has a contract with the Daly Judge Mining Co., the latter having between 12,000 and 15,000 tons of zinc middling available for separation. ——The ore shipments from the Park City mines for the week ending August 1 were as follows: Daly Judge, 966,000; Silver King, 1,716,000; Daly West, 1,000,000; Hayes lease, 25,000. Total, 3,707,900 tons.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—W. M. Crummer and Nels Erickson, who are leasing the Insurgent mine, at Republic, are driving on a vein on the lower adit level which has recently been intersected by a cross-cut. It is 12 ft. wide at that point and appearances indicate a pay-shoot near at hand.——Richard Mulroy, lessee of the Republic mine, has another carload of ore ready for shipment.

Republic, August 3.

STEVENS COUNTY.

(Special Correspondence).—In the Last Chance mine, on Deep creek, in the Northport district, at a depth of 70 ft. a 2-ft. vein of high-grade galena has been struck.——At the Jay Gould mine, in the Chewelah district, five men are employed sinking below the 100-ft. level. The shaft will be sunk to the 200-ft. level. A blind lead, having a width of about 25 ft., was struck on the 150-ft. level, the ore from which assays $9 per ton.——A 6-ft. vein of high-grade copper ore has been discovered on Granite Mtn., east of Box canyon, in Metaline district.

Republic, August 3.

CANADA.

BRITISH COLUMBIA.

A serious forest-fire has been raging in Kootenay since August 1. The town of Fernie is completely devastated, with 20 lives lost and $5,000,000 worth of property destroyed. Michel will probably be wiped out, and Hosmer, Sparwood, and Coal Creek are seriously damaged. The total loss of lives will probably be at least 40, and fully 7000 people are homeless. The burned area stretches for 50 miles along the Canadian Pacific railroad, and while it is but one mile wide in some places, in others it is 10 miles. The loss to standing timber is estimated at $2,000,000. It is rumored that the origin of fire at Fernie was of incendiary nature.——The Diamond-Texas, near Greenwood, which has been shut down for some time, has resumed again.——It is stated that the Prince Henry, one of the best high-grade properties in Greenwood camp, is expected to resume operations shortly. A deal is at present under way for the purpose of financing the work.——Shipments from Boundary mines for the week ending July 25 amounted to 38,113 tons. This is the biggest weekly tonnage in the history of the Boundary, with one exception. In the third week of September, 1907, the shipments were 41,734 tons. The next largest was 37,111, in July, 1907.—— Following is the tonnage of ore shipped from and crushed at the mines of Rossland for the week ending July 25: Centre Star, 3450; Le Roi, 1500; Le Roi No. 2, 525; Sunset, 25. Total, 5500 tons. Total for year to date, 162,007 tons. The district shipments for the past week were: Boundary, 38,107; Rossland, 5500; Slocan Kootenay, 2032 tons. Total for the week, 45,639 tons.——The Kootenay Development Co. has taken a lease on the Silver King mine and the Hall Mines smelter at Nelson. The new company will change the motive power of all machinery to electricity. The lower levels will be unwatered and systematically worked. ——According to reports from Nelson, the well known Snowshoe mine, at Phoenix, is about to resume operations.

ONTARIO.

The production of the mines of Cobalt for the first six months of 1908 amounted to 9151 tons, which is an increase of 2608 tons over the corresponding figure for 1907. The number of producing mines has increased from 20 in the first half-year of 1907 to 26 in the same period of 1908. The La Rose, O'Brien, and Nipissing are at the head of the list in both tonnage and the amount of smelter returns. During June, 1908, 19 Cobalt mines shipped 1585 tons. The development in Cobalt camp during the past six months has been of a permanent character. Concetrators have been erected at three mines and a custom concentrator started this week. The treatment of the low-grade ores means decreased tonnage but increased smelter returns.

Special Correspondence.

LONDON.

The 'English Rand' Bubble.—Re-organization of Stratton's Independence. — Elmore Process at Broken Hill. — Affairs of the Zinc Corporation.

The self-styled 'English Rand,' or in other words, the Chastan Syndicate, Ltd., that was floated by C. F. Kennedy about eighteen months ago, has already come to an inglorious end. At the time of its inception the exact location of this wonderful ore deposit was kept a secret. There is nothing like secrecy when creating a boom. The shares were traded off at high premiums to admirals, generals, and such gentlemen who are prone to think they know more about mining than members of the mining profession. Some of the shares were allotted to people without their knowledge, but it was only after the bubble was pricked that the allottees thought it worth while to repudiate their liability for calls. The deposit is a conglomerate in the iron and coal beds of the Forest of Dean, Gloucestershire. A good deal of money was spent in prospecting, and in some places the assays showed a few pennyweights of gold. Two mining engineers of high standing examined the workings on behalf of their clients who were thinking of taking shares. Their reports are, however, private property, and have not been published. The Company is now at the end of its resources and the directors are all resigning. A meeting is to be held shortly to consider whether more money shall be put up or whether the scheme shall be decently buried. The directors still assert that there are excellent hopes of finding workable deposits, and they also hold out the bait of rich iron-ore and mines on the property. There is no reason why, in theory, a 'fossil placer' should not exist in this place, but present indications do not warrant haphazard expenditure in prospecting for it. As regards the presence of iron-ore, this, of course, is a matter of public knowledge. The iron-stones of South Wales and the adjoining counties in England were worked long ago upon their outcrops. In fact, the lines of outcrop are still indicated by the iron industries, which, however, now draw their supplies of ore from abroad or from other parts of England. The only place in Great Britain where the iron-stones associated with the coal measures are profitably worked is in the Ayr district of Scotland. On the whole, I am of the opinion that the shareholders in the Chastan Syndicate had better leave the iron-ores of the Forest of Dean alone.

In your issue of May 23 I mentioned the case of Stratton's Independence, Ltd., which requires £50,000 more capital for the new plant for treating the dump-ore, and I outlined the scheme for raising the money by the issue of debentures carrying 25% interest and dividend. This scheme has unfortunately not gone through, as less than half the required amount was subscribed. The directors are now bringing forward a proposition to re-construct the company. As I have several times mentioned, the method of raising money by re-construction and assessment is not popular at present among directors, owing to a recent dicision relative to the rights of dissentient shareholders. However, in the case of Stratton's, there seems now to be no alternative. The proposition is to form a new company with a nominal capital of £125,000 in a million shares of 2s. 6d. each, credited with 1s. 6d. paid. The liability of one shilling per share will provide £62,000 if everybody pays up, and the directors feel confident that a sufficient number of shares will be taken to provide the necessary £50,000. The present issued capital is £1,000,000, in 1,000,000 shares of £1 each, and the current quotation varies from 1s. to 18d. The re-organization scheme brings down the nominal value of the share to its real value. There is reason to think that shareholders ought to pay up, for there is every indication that they will get their money back from the dump, and with the mine put into shape again there is a possibility of further profits being made by the lessees.

In your issue of February 29 last, I gave some particulars of the present state of the Zinc Corporation, the Australian company which was formed by Bewick, Moreing & Co. for the purpose of utilizing the stacks of zinc tailing at Broken Hill. I mentioned that after trying the Potter and the Cattermole processes without satisfactory results the directors had decided to adopt the Elmore vacuum plant. I have now to report that after five months continuous use, this plant has become an undoubted success, and the process promises to establish itself as an important factor in the utilization of ores. It is continuous, automatic, and works at ordinary temperatures. I do not think that most Americans appreciate the process, so I will mention that it is of value in two circumstances, firstly when the sulphides are liable to float away in water-concentration, and secondly when the sulphides and the gangue are of nearly the same specific gravity. The Broken Hill problem comes under the latter category. The galena can be separated in jigs from the blende and the gangue, though not very completely, owing to the intimate mixture of the two sulphides. It has been possible to save 60 to 70% of the lead and silver by jigging, but the zinc tailing has until recently been stacked. The advantage of the flotation process is that it will separate the sulphides from the gangue in spite of the similarity in the specific gravities. In operating the Elmore process, the zinc tailing is first sent to Huntington mills and grinding-pans for comminution. The average content is about 20% zinc, 5 to 6% lead, and 8 oz. silver. After passing through the Elmore plant a concentrate is obtained averaging 43% zinc, 12% lead, and 16 oz. silver. The proportion of zinc extracted is about 89%, but at present the extraction of the lead is rather lower. There has been a steady increase in the capacity of the plant, and also in the extraction, and there is every reason to believe that the figures can be still further improved. At the present time 13,000 tons are treated per month, yielding 5000 tons of concentrate. The concentrate produced is not a readily marketable commodity, and the terms offered by the firm of Aron, Hirsch & Son, of Halbertstadt, Germany, who have contracted to buy 40,000 tons per year, were not sufficient to yield a good profit. The Company has therefore installed a furnace for driving off the oil, and a set of Wilfley tables, in order to produce separate lead and zinc concentrates. This separation can be effected owing to the finer grinding, and to the absence of gangue. The Company does not give exact figures for the grade of the two concentrates. All that is said is that in the final zinc concentrate the zinc content is raised to 47%, and that 230 tons of lead concentrate are produced per month. The lead content of the zinc concentrate is not given, nor the figures for lead and zinc in the lead concentrate. We are not told either how much zinc concentrate is produced nor how much of the mixed concentrate cannot be separated into separate lead and zinc concentrates. This question has nothing to do with the Elmore process, but it is none the less important to the Zinc Corporation. The cost of treatment is at present about 10s. per ton, and it is hoped to eventually get it down to 8s. The price paid for the tailing that is being worked at present was 5s. per ton. It is estimated that under the present sales contract, the process will begin to pay when zinc is over £17 per ton. The financial vicissitudes of the Zinc Corporation have been very great, and promise to remain so for some time. In the February article mentioned, it was stated that the issue of £182,000 new preference-shares had not been an unqualified success, for only £113,000 had been taken. The attempted issue of the remainder has proved a failure, and in consequence the Company has been hard-pressed for funds wherewith to meet the installments of the purchase money for the stacks of tailing as they become due. In some cases it was possible to vary the contract so as to postpone payment, and in others the options have been abandoned. There was, however, an immediate necessity for £30,000, and this has been raised as a loan from the bank, on the security of Lake View Consols, and guaranteed by C. A. Moreing, H. C. Hoover, and F. A. Govett, personally. The Company is naturally badly hit by the present low price of metals. Its future depends to a large extent on the metal market.

JOHANNESBURG, TRANSVAAL.

Rand Mines Reach Billion Dollar Output. — Decreasing Costs and Low-Tenor Ore. — Developments on Upper Witwatersrand. — Records in Shaft Sinking.—Amalgamation of Technical Societies.

With the declaration of the gold output for June, to be made in a few days, the Witwatersrand will have achieved the distinction of an aggregate yield amounting, since the commencement of operations in 1887, to £200,000,000. Dividend declarations for the closing half-year approximate the record figure of £4,000,000, making the corresponding aggregate of distributions £49,000,000 to date. The results for the half-year exceed the standard for 1907 (when $129,000,000 was produced) by $7,000,000 to $8,000,000 per annum. Conspicuously gratifying in the records of the period has been the advance in working-profit. Critics can justifiably point to many causes for the loudly proclaimed 'reduction in working costs' not essentially indicative of higher efficiency, to curtailment of development, to inexpensive extraction of lower-grade ore from the foot-wall of old stopes, and to divers other factors; but it is unquestionable that in conjunction with the improvement of reduction and treatment methods, underground conditions have been materially bettered from an economic standpoint. There is more scientific treatment of the lesser mining problems. The miners themselves are now obliged to give a greater share of personal attention to the running of their machines and to remain satisfied with smaller checks than in the prosperous pre-strike days. Shift-bosses, too, are now recruited more exclusively from the ranks of trained mining engineers, who find the survey-office no longer the best step to a management. The re-organization of methods of underground administration has been largely instrumental in the reduction of average working-costs from $5 or $5.50 to the present average of $4.35 per ton milled. In May, fifteen companies operated at less than $4, and five of these at under $3.50. It is constantly urged that maximum profits, not minimum costs, should be the primary objective. With the prevailing system of forcing the mill to its utmost capacity, and with greatly increased stamp-duty, reduction of grade has been inevitable and generally warranted. The gradual reduction of yield per ton since the war has been from $9.48 to $7.54 per ton.

Those who welcome signs of industrial expansion in other parts of the Transvaal, of which a present curse is over-centralization, may happily note an advance in the amount of gold contributions from Lydenburg, Barberton, Nigel (virtually a section of the Rand), and other districts. The extreme gold-yield possible for 1907 totalled $4,800,000, while the rate of production is now $1,000,000 in advance of this figure. While the downward course of working-costs has duly turned the thoughts of Rand managements to the lower-grade blocks of ore, formerly considered unpayable, renewed attention is likewise paid to the few equipped mines between Modderfontein and Randfontein, still inactive. A notable break in this 50-mile chain occurs between the west-central and Roodepoort sections of the Rand, representing the Aurora West, Bantjes Consolidated, and Vogelstein's Consolidated Deep properties. The Aurora West is being unwatered, and financial arrangements are being made for the revival of the other two mines. There is yet another direction in which the hopes of the more optimistic may turn without leaving the Rand area, namely, in the 'banket' beds of the Upper Witwatersrand formation. The Kimberley and the Elsburg series, containing several feebly-auriferous members, run parallel to the Main Reef, one to three miles south, along the greater part of the Rand. Both lines are marked by an abundance of small shafts and trenches, put down in the earlier days, when grade-requirements to ensure payability were higher than now. A few weeks ago, an operator backed by Sir Charles Metcalfe (of Rhodesian fame) and the Rhodes Estate commenced sinking on the Elsburg reefs near the township of that name. Three or four shafts are being put down on a large-pebbled conglomerate bed (characteristic of the series), and average pannings of $3 to $6 are claimed, though my own samplings at a few points do not confirm this valuation. It must be acknowledged, however, that the dozen miles of Kimberley and Elsburg reef outcrops from which good colors can be obtained, having features which closely resemble those of the Main Reef, provide a more attractive area for further prospecting than many distant fields.

In regard to deep-level mining, it is to be noted that the South Rand Co., situated on the dip of the Crown Deep, and the latest addition to the list of active Central Rand companies, has nearly completed its permanent head-gear (104 ft. high) preparatory to the sinking of its vertical shaft. In accordance with the recently-accepted principle, sinking is being deferred until all machinery and plant, necessary for the future exploitation of the mine, are completed, temporary installations to carry the shaft to a moderate depth being considered uneconomical. The excavation is at right angles to the strike of the formation. The South Rand should cut the reef at about 2100 ft., and its prospects of success, always good in such a favored locality, have been strengthened by highly satisfactory developments in the Crown Deep at its northern boundary. Like those of the Turf, City Deep, and Brakpan mines, its shaft is of seven compartments; it measures 44 ft. 2 in. by 8 ft. 2 in. outside timbers. Progress must be watched with particular interest, for the benefit of widely accumulated experience is now available for the determination of methods, and the vertical shaft of great depth is less likely to appear as a factor in deep-level development than was suggested by former programs. In spite of increasing depths of shafts, both the Turf and Brakpan mines continue to record admirable footages. The former, at 2500 ft., now averages 135 ft. per month and the latter, in which the world's record of 204 ft. was made last year, and in which breaking-conditions are more favorable, has averaged 163 ft. for the last six months at from $112 to $142 per foot. This Brakpan shaft is today 3600 ft. deep.

The Chemical, Metallurgical & Mining Society concluded a year of great practical usefulness at the last meeting, when the chair was vacated by John Yates in favor of R. G. Bevington, who, with his colleagues, will be called upon to work strenuously during the ensuing year to preserve old standards. Rand technical and scientific societies have shared sensibly in the trials of the long-enduring depression, and finance committees have had to exercise unwonted discretion to satisfactorily weather the storm. Questions of economy have largely dominated the proposal for the amalgamation of the Transvaal Institute of Mechanical Engineers and the South African Association of Engineers. E. J. Laschinger, a prime mover in the matter, spoke at the last meeting of the Chemical, Metallurgical & Mining Society in favor of greater co-operation among the various societies and among other things suggested the organization of a joint social club for mining men. This idea might develop, by force of prevailing circumstances, into some scheme of administrative and journalistic co-operation, though the strength of numbers possessed by the less exclusive chemical society, and the antipathy of its council as a whole to any amalgamation threatening to diminish the body's individuality, constitute strong factors opposing closer union in its extreme aspects.

MEXICO.

Mexican Central Extension of Parral.—Inde Consolidated and Guadalupe Gold Mining Companies. — Smelters at Inde and Santa Maria del Oro.—Velardena Plant.— American-Mexico Mining & Development Co. Fiasco.

The first ten kilometres of the extension of the Mexican Central's Parral branch from Rosario, the present terminus, on toward Indé, Durango, has been approved by that State Government, and it is certainly hoped that the same may be promptly built and the entire road pushed on to completion. Indé is now a hard day's horseback ride from Rosario station, and the consequent high freight rates overland keep a number of good mines closed, as less than 100-oz. ore leaves little or no profit. The principal properties at present are the Indé Consolidated Gold Mines Co., and the

Guadalupe Gold Mining Co., which are on the same vein. This is a quartz vein with the gold finely disseminated. They both have 100-ton cyanide mills, from which excellent returns are being obtained, so that they are not so absolutely dependent on the railroads. The Indé Consolidated is also preparing to erect its electric power-plant on the Nazas river, for which it has obtained a concession from the State Government. The Indé Reduction Co., with its little 100-ton smelting plant, helps some of the mines producing sulphide ores, and by such concentration and saving of freight it can offer a little better treatment charge than may be obtained outside, but the majority of the properties can handle only high-grade ores, which consequently limits the number of producers. There are several properties in the district that would give excellent results to capital that would erect cyanide mills for the treatment of silver ores. Beyond Indé is Santa Maria del Oro, of the Magistrál district, which will also be greatly benefited by the completion of the railroad. Herein is situated the plant of the El Lustre Mining & Smelting Co., which, notwithstanding the great expense of bringing coke and other supplies, has, by the use of wood, gas-producers, and electric power, cut down its operating expenses so as to be able to profitably mine and smelt an ore carrying a couple of ounces silver, half an ounce gold, and about one per cent of copper. Last year the plant was enlarged, so that since the beginning of 1908 the total smelting capacity has been 500 tons daily. Another Durango plant that is coming forward is the Velardeña plant, leased by the American Smelting & Refining Co. from the American Smelters Security Co., which has overcome a number of metallurgical difficulties and is making much better recoveries, so that it is hoped the whole plant may soon be in blast. The mention of Velardeña, by virtue of proximity, brings to mind the almost forgotten little 'mushroom' affair known as the American-Mexico Mining & Development Co., which had its smelting plant a little over three years ago about half-way between the old Velardeña smelter and the present new plant. It had a few little mines for which it paid a big price, declared dividends out of stock sold (for the smelter never ran long enough to pay for ores purchased, nor the mines for the development work), and for which the Chicago Grand Jury a few weeks ago indicted a Dr. Phillips, the president; A. T. Grove, dentist and promoter; W. S. Dillon, lawyer and general manager; and others connected with the transaction. It is remarkable how people will bite at such things as these. This concern had no difficulty whatever in selling stock, and had private-car parties down from the United States, showed them the Torreón smelter, that they might see what the American-Mexico was going to be, and captured their money while many good things went begging.

SALT LAKE, UTAH.

Blowing-in of Smelter at Tintic.—Utah Copper Production for June.—Boston Consolidated Mining Co.—Smelter at Ogden.

An event last week worthy of note was the celebration commemorating the blowing-in of the new smelter in the Tintic district and which has been built by the Tintic Smelting Co., at a cost of at least $250,000. The plant, however, did not begin operations on the date set for it, for the reason that the constructors were unable to get it ready. But plans had been made for a demonstration, and they were carried out. Excursions were run into the camp by the Rio Grande and the San Pedro, Los Angeles & Salt Lake railroads, and several thousand people participated in the festivities which were followed by a visit to the mines of the several Tintic camps. It will be at least two weeks, so the officials say, before the smelter will be ready for commission; but in the meantime, custom ore is being received. The output of the Tintic mines last week amounted to 114 carloads.

Much interest has been taken in the report of D. C. Jackling, general manager for the Utah Copper Co., showing the June production of that corporation's Bingham mine to have been 4,105,920 lb. of copper, or 34,000 lb. under the record for the previous month. Taking into consideration, however, that there was one less working day in June, the showing is not so bad. All things being equal, the June output would have exceeded that of May by 99,000 lb. The directors of the Company will meet in Salt Lake in a few days to post the dividend, which will probably be 50c. per share. Engineers of the Company are preparing plans to increase the capacity of the concentrator at Garfield to treat 10,000 tons of ore per day, the present capacity being 6000 tons. The Boston Consolidated Mining Co. has succeeded in obtaining a modification of the terms of its contract with the American Smelters Securities Co., and has resumed the shipment of ore from its Garfield concentrator to the copper smelter of the last named corporation. Approximately 800 tons of ore per day is being shipped from the Boston Con. mine for concentration. This output will be doubled by September 15. The Utah mine of Fish Springs paid the usual dividend of 3c. per share, or $3000 last month.

The Utah Copper Co. plans to increase the output of its Bingham mines at least 40% within the next year and has made plans to build an addition to its Garfield concentrator to meet the demands. It is also intended to make many other improvements representing a total outlay of approximately $750,000. It is estimated that it will require nine months to complete this construction and that with the new equipment the Company will be in condition to produce from 85,000,000 to 100,000,000 lb. of copper annually, the production now being not quite 60,000,000 lb. The initial dividend of 50c. per share, or $367,500 is payable on September 30. The treasurer of the corporation has about $1,600,000 in cash on hand. A recovery of 23 lb. of copper at a cost of 7½c. per ton is being made.

The United States Smelting, Refining & Mining Co. is operating four lead furnaces on oxidized charges and by August 15 will have its new roasting system in commission. A change is being made from hand roasters to the converter-roaster in order to make less acid in the fumes, which it seems, can be neutralized by the operation of the Company's new patented zinc-oxide process, thereby eliminating danger to vegetation. It was upon this representation to the court that the injunction resulting from the trial of the late smelter-smoke cases was modified so that the Company could resume smelting ores. The United States lead mines at Bingham are producing again and the low-grade product is being treated in the concentrating mill near the smelter and which has capacity for 300 tons per day. The Uncle Sam Consolidated Mining Co., operating in the Tintic district, will resume dividend payments again this month after a recess of about six months. There is nearly $40,000 in the treasury, with production going on steadily. A shipment of 80 tons marketed last week brought net returns of $180 per ton.

The copper smelter near Ogden, leased recently to the Independent Smelting Co., has been placed in commission again. One copper furnace is in use and the second will be within a fortnight. The plant was erected by the Utah Smelting Co., and operated several months last year as a competitor of other Utah smelters, but the venture proved unsuccessful from a financial viewpoint for the reason that a large tonnage of ore, bought during high metal-prices, could not be moved before serious decline had occurred. Besides the Company had several unprofitable ore-contracts on its hands. The smelter had been closed since last October. The president of the Independent company is Matt S. Browning, of Ogden; the general manager, J. B. Jenson of Salt Lake. R. H. Vail, formerly with the United States Smelting, Refining & Mining Co., is superintendent. It is believed that a close working alliance exists with the United States company, as the latter is without facilities for the treatment of copper ores at its own plant on account of the adverse decision of the Federal Court.

Matthew Cullen, of Salt Lake, has purchased the Rebel mine in Beaver county and will equip it for a vigorous development-campaign. The ground has been productive of several hundred thousand dollars worth of silver-lead ores in the past.

BUTTE, MONTANA.

Boston & Montana Output.—Production of District for July.—Tuolumne and Butte & Arizona Companies.—Advance in North Butte Stock.—Copper Eagle Mining & Smelting Co.—Cable Consolidated Company.

The Boston & Montana Co.'s mines were operated at about 40% of their normal capacity during July, the reduction being due to the shut-down of the company's smelter at Great Falls as a result of the damage done to the plant by the June floods. Because of the restricted output of the Boston & Montana, the copper production of the Butte district was again considerably below normal for the month. The total was 26,235,300 lb., against 13,159,000 lb. in June. It is expected that the Boston & Montana smelter will be in commission again by the middle of the month.

The daily ore tonnage, yield of copper per ton, and the daily average copper production for July were as follows:

Companies.	Daily tons.	Copper, lb. per ton.	Copper, lb. daily.
Boston & Montana	1,500	80	120,000
Anaconda	3,600	71	255,600
Butte & Boston	650	70	45,500
Washoe	550	68	37,400
Parrot	500	61	30,500
Trenton	450	62	27,900
North Butte	1,425	100	142,500
Butte Coalition	850	90	76,500
Original	1,200	82	98,400
Pittsburg & Montana	150	80	12,000
	10,875		846,300

The various companies contributed to the June totals as follows:

Companies.	Ore, tons.	Copper, lb.
Boston & Montana	46,500	3,720,000
Anaconda	111,600	7,923,600
Butte & Boston	20,150	1,410,500
Washoe	17,050	1,159,400
Parrot	15,500	945,500
Trenton	13,950	864,900
North Butte	44,175	4,417,500
Butte Coalition	26,350	2,371,500
Original	37,200	3,050,000
Pittsburg & Montana	4,650	372,000
	337,125	26,235,300

The Tuolumne Mining Co. is one of the first of the newer concerns to develop pay copper ore. At a depth of 1000 ft. in the Tuolumne claim, just south of and adjoining the Jessie mine of the North Butte Co., extensive exploration has been done, and some really good ore has been cut in the first vein south of the shaft. The vein at that point is 26 ft. wide, and there are 4 ft. of ore on the hanging wall and 2 ft. on the foot-wall, assays from which showed 29.1% copper, 20 oz. silver, and 80c. in gold per ton. The Company is preparing a foundation for a complete new surface plant, including a 22 by 60-in. Nordberg, first-motion engine, with a capacity to work to a depth of 3000 ft.; three new boilers of 250 hp. each; a 15-drill compressor, and a new head-frame.

The Raven Mining Co. has resumed shaft-sinking, and will carry the incline from the 1100 to the 1300-ft. at least. At the same time development on the 1100-ft. level is being continued. At a meeting of the directors of the Butte & Arizona Copper Mining Co., held in Butte, it was decided to resume operations at the mines in Arizona immediately. The property of the Company is situated at Hereford, about 35 miles from Bisbee, and as soon as supplies can be taken to the camp work will begin. Since fire last spring destroyed the surface building and the Company's supplies, the mine has been closed. The property is being opened by an adit, now 2300 ft. long, and it is expected that the vein will be reached at a depth of 850 ft. from the surface in about two months.

The recent negotiations to raise funds for resuming work on the Butte & London seem to have fallen through, and there are no prospects for an early improvement in the affairs of that Company. The Colusa-Leonard Co. quit work early in the period of the panic last year, because a New York firm which had made promises and efforts to finance several new Butte companies failed to come to the rescue. The Reins Copper Co., which passed into the control of Colonel Guffey and associates of Pittsburg, may get onto its feet again if the $600,000 bond-issue is successful.

The stock of the North Butte Mining Co. has been a spectacular feature the past two weeks, but the rapid advance has not been surprising to the people of Butte among whom the merits of the North Butte are known. The Company is certainly producing copper, at a cost little in excess of 7c. per lb., and its monthly output is more than 4,000,000 lb. The Company has a capitalization of only 400,000 shares, and the advance of one cent per pound on copper means a great addition to the earnings. The North Butte is claimed by many to be the greatest copper mine in the world. There is one other property in Butte that will some day rival North Butte, and that is Butte Coalition. The latter is producing a quality of ore almost uniformly as rich as that of the North Butte, but the production is at present limited to about 850 tons per day. By the first of next year, with the completion of the development now being done through the Tramway shaft, the output will be fully 2000 tons per day, counting on only the Minnie Healey and the Rarus mines. In addition to these two mines, however, the Coalition gets a share of the profits from the ore mined by the Boston & Montana in the Red Penn ground, and from the Parrot Co. on ore mined from the Nipper vein.

H. V. Winchell, former chief geologist for the Amalgamated Co., who left the employ of that company to fill an engagement with the Great Northern railway in a similar capacity, is no longer connected with the Hill interests. Mr. Winchell achieved a great reputation as a geologist through his connection with the Amalgamated. During his employment by the Great Northern railway Mr. Winchell devoted considerable time to developing cases against small companies and small individual mineral holders in the Butte district, his contention being that the Great Northern and the Northern Pacific owned the mineral rights claimed by others, and several actions are now pending to determine the question. Mr. Winchell also acted as consulting engineer for the Butte & London Mining Development Co., and it was on his judgment that the Company conducted its development.

The Copper Eagle Mining & Smelting Co. has resumed operations, work being confined to the Eagle claim, upon which there is a shaft 265 ft. deep, with 300 ft. of drifts at the 200 and 250-ft. levels. With this superficial development the Company has shipped 433 tons of ore from the 200-ft. level, having a net value of $8353, and 656 tons from the 250-ft. level, having a value of $23,000.

PARK CITY, COLORADO.

Developments on Engineer Mountain.—Shipments from Highland Chief.—Hanna Mining & Milling Co.'s Equipment.—Rich Ore in Cinnamon Pass.

With the drop in metal prices last fall, shipments of ore from Hinsdale county, which had become larger than for a number of years past, practically ceased, and the year 1907, which had opened with great activity and unusual promise for this district, also witnessed the cessation of mineral output. This part of the world, however, is used to being hard hit, and when an oldtimer was asked how Lake City was standing the panic, he replied: "Fine; she has been in training for it for 25 years." Hinsdale county takes punishment remarkably well, and notwithstanding the deadening effect of the decline of metal prices, development work to some extent was carried on during the past winter in 27 properties, situated in various parts of the county. Notable among these were the Frank Hough, Highland Chief, Pelican, Fanny Fern, Clara L., and Great Ohio. Along with the melting of the snow work was renewed here and there

throughout the county. The exact conditions today are rather encouraging, for while there is little production, there is considerable well-directed development, which argues well for the future. Perhaps the most interesting revival is that of the Frank Hough mine, situated on Engineer mountain, or the American Flats. The Frank Hough was closed down in the fall of 1886, after having produced several thousand tons of ore containing 25% copper, 50 oz. silver, and one-fourth ounce gold per ton. The statements relative to the ore left in the mine are rather vague. It is known, however, that in the lowest workings, less than 400 ft. in depth, ore was uncovered for a length of over 100 ft. and of considerable width, the drift being timbered in places three and four sets wide, which represented the width of the clean ore. Last year the Frank Hough Mining Co., with A. E. Reynolds as the leading spirit, re-built the surface improvements, which were destroyed by fire several years ago, and commenced the work of restoring and remodeling the old shaft, enlarging it into three compartments. The work was continued all winter, and the shaft is now completed to 400 ft. in depth, and cross-cutting to the vein has been started.

The Wyoming mine, also on Engineer mountain, the property of the Pittsburg Mines & Metals Co., has recently been started after lying idle for nearly two years. A force of 12 men is employed in shaft sinking on a vein of high-grade ore, samples of which assay one ounce gold and 1700 oz. silver per ton. This mine has for several years periodically shipped small lots of high-grade ore, and its further development is of importance to the vicinity.

In 1881 the Hinsdale county slopes of Engineer mountain and the American Flats bristled with a forest of stakes, erected by an army of erstwhile 'peggers.' The hardest work they did was to place the stakes, and the larger part of that promising region is still waiting for pioneer blasts. It is known from reliable sources that there are numerous outcrops of veins in this district which carry gold from 0.25 to 9 oz. per ton, yet no one has undertaken development except the places mentioned. The Highland Chief mine on Sheep mountain is now a steady shipper of carbonate and sulphide of lead ore. This property has been operated almost continuously for the past two years. The mine is developed to a depth of 190 ft., and has been a shipper from the start. In the 190-ft. level an ore-shoot averaging about 4 ft. wide has been uncovered 220 ft. in length. Both breasts of this level show the same width of ore. The Independence, an adjoining property, on the end line of the Highland Chief, probably the same vein, and producing the same class of ore, is again being operated after a shut-down of nearly a year. The Hanna Mining & Milling Co., owning the Moro and other property near Capitol City, is about to let contracts for 700 ft. of development work on the vein. This company has expended a large sum of money upon surface improvements, including an aerial tramway, a hydro-electric power-plant capable of generating 1000 hp., and in remodeling and adapting its mill to treat the complex sulphide ores. These improvements were completed last season and several hundred tons of ore tested in the mill resulted in a close saving of the metals in the ore. The development of the mine had not kept pace with the milling facilities, and the company became financially involved; hence a shut-down occurred early last fall. G. H. Martin, the energetic manager of the company, has succeeded in freeing the property of its bonded indebtedness, and has also raised a fund for the further development of the mine. The Ute and Ulay and Hidden Treasure mines are closed. There has been a rumor of a consolidation of these well-known silver-lead producers. A fair amount of prospecting is being done throughout the Henson Creek region, and some favorable results are reported from time to time.

There is renewed interest in the Cinnamon Pass and Cleveland Gulch districts. Since the closing of the Isolde, several years ago, this region had been almost abandoned until the spring of 1907, when Lake City people commenced negotiations for a lease and bond on the Hollister and Inez claims. These parties are starting a cross-cut to prospect the ground below the Isolde shoot, which dips into and was partly mined in Hollister ground. This vein—the Cinnamon fault—in its course to the northeast passes through a part of the Detroit claim in San Juan county and enters the Hollister through its southwest end-line, passes out of the northwest side-line of that claim into the Isolde ground, which it traverses for a short distance, and again passes into the Hollister through the same side-line. The rich outcrop of the Isolde was 30 ft. northwest of the Hollister side-line. The shoot was mined to a depth of 80 ft., and is said to have produced high-grade gold (telluride) ore to the value of $125,000. Three hundred and twenty-four tons of this ore averaged 10 oz. gold and 16 oz. silver per ton.

The property of the Dupree Co., comprising several claims of the group which includes the Isolde, is under option to Silverton, Colorado, and Detroit, Michigan, people. A payment of a large part of the purchase price has been made. Under this option the vendees cut a vein of seven-ounce gold ore, cross-cutting in the Isolde northwest from the old workings. James H. Sloan, owner of the Fairview claim, situated on the ridge between Cleveland Gulch and Horseshoe Basin, said to be on the Cinnamon fault, recently discovered some rich free-gold rock in doing surface-prospecting on his claim. From the Isolde on Cinnamon Pass to

Lake City, Colorado.

the Golden Fleece at Lake San Cristóbal, a distance of 13 miles, the main range in Hinsdale county having an elevation above sea-level of 11,000 to 13,000 ft., has been but little prospected. There are but few patented properties in the high range between the places mentioned, and only here and there a prospect hole, yet high-grade gold ore float is frequently found all along this range.

The Mexican-American Co., said to be controlled by Englishmen, has secured the Black Wonder property at Sherman. Gen. F. Joubert Pienaar, who served under Joubert in the Boer War, is in charge. Gen. Pienaar has taken an option on the Sterling group at the head of Cottonwood gulch. In 1874 Enos T. Hochkiss and associates located the Golden Fleece, then the Hotchkiss mine, and Joel K. Mullen staked the Ute and Ulay veins. The first-named gained a world-wide reputation later on as a high-grade gold mine, and the Ute and Ulay have produced a large tonnage of silver-lead ore. Following the advent of Hotchkiss and Mullen, Lake City became the chief town in the 'Silver San Juan,' and was the distributing point for a large area. In the early eighties the railroads began to crowd out the 'bullwhacker' and the 'muleskinner,' reaching out into the San Juan country, to the towns of Silverton, Ouray, Telluride, and Rico, but left Lake City a 'stage-town' until August, 1889. Since then, Hinsdale county has not kept pace with the other San Juan counties in the development of its mineral resources. Modern transportation facilities diverted investors to more easily accessible places. The reputation of the county has also suffered from ill-advised mining schemes, and from much inefficient management, so that its really splendid mineral-resources have not received the attention they deserve.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Dacite as seen at Goldfield is only a quartz-bearing andesite, and is not similar to the highly silicious dacitic rhyolites of Tonopah. It consists of labradorite, hornblende, biotite, augite, and quartz in the usual andesitic groundmass. It is much more decidedly porphyritic than the andesite of the region, which otherwise it closely resembles. By analysis it shows 60% silica, which classes it with the neutral rocks, instead of the acidic eruptives.

Settlement of slime in a small cyanide plant involves dispensing with mechanical apparatus. A series of vats, square or round, with vertical sides, should be constructed so that the pulp-stream may be diverted from any one vat while it is being discharged. The pulp should flow successively through the entire series, and should enter each vat at the centre, and discharge equally around the entire periphery into suitable launders. Thus the velocity of current is checked to the utmost, so that it will deposit its load of solid matter. The vats may have conical bottoms or not, according to the expense justifiable by the conditions of ore-value and capacity of plant. Conical-bottom vats are more costly, and also require expensive supports, and would hardly be used in a small plant.

Cement tables have been revived at the San Prospero mill in Guanajuato, Mexico, and renewed testimony to the efficiency of such a surface for concentration is forthcoming. The practical difficulties have always been to secure a perfectly smooth surface. This can be done by making a wooden form against which the cement may set, saturating the form and truing it up while wet, and applying it to the cement with proper provision for keeping it saturated for several days. The proper mixture of sand and cement will vary with the size and character of the sand. By remembering that the ideal concentrating surface is ground plate-glass, the best attainable mixture for the cement can be easily reached.

Retaining walls are usually proportioned by an empirical rule, although a number of theories, resulting in theoretical formulas, have been advanced. All of these, the best known of which are Coulomb's, Weyrauch's, and Rankine's, depend upon the three following assumptions: first, that the surface of rupture along which the embankment tends to slip is a plane; second, that the point of application of the lateral pressure of the earth is at a distance of one-third the height of the wall from the bottom, which is equivalent to assuming that the variation of the pressure in a mass of earth is the same as in a liquid; and third, an assumption of the direction of the line of action of the pressure (different in each theory). Because of these assumptions, and of the fact that no reliable experiments have verified the conclusions made, no theoretical formula is of much practical use to the designer of retaining walls. Benjamin Baker, an eminent English engineer, says, "Experience has shown that a wall, to sustain earth having a level top surface, the thickness of which is one-fourth of its height, and which batters 1 or 2 in. per foot on the face, possesses sufficient stability when the backing and foundation are both favorable." Many engineers make the thickness of retaining walls equal to 0.33 or 0.4 the height, using a small batter on the face. A majority of the failures of retaining walls are due to defects in the foundation rather than in the design of the wall.

Nevada law relating to location of placer claims, which include oil claims, requires the posting of a notice on a tree, rock in place, post, or monument, giving names of claim and locator, number of feet or acres claimed, and the date. On unsurveyed land the surface boundaries must be marked in the same manner as in locating quartz claims, but on surveyed land, the initial monument or location notice is all that is required. Within 90 days after posting the notice at least $20 worth of work for each claim of 20 acres or less must be performed, and record must be made with the District or the County Recorder. To take 160 acres of land by one location an association of 8 persons is required. One person, however, may locate as many claims as he desires.

For hardening high-speed tools the barium-chloride process has many advantages. Commercial barium chloride, to which about 2% of sodium carbonate has been added, is melted in a graphite crucible and raised to a temperature of 2000 to 2125°F. The tool is kept in the bath until it attains the temperature of the bath and is then quenched, preferably in an oil-bath. The superiority of this process over a lead-bath or a gas furnace lies in the fact that when withdrawn from the barium-chloride bath, the tool is covered with a thin film of the chemical which prevents oxidation. Taps, threading dies, and other delicate tools hardened by this process retain their size and sharp cutting edges and it is claimed the difference between a hardened and an unhardened tool cannot be detected by inspection.

Speculative locations of mining claims, as distinct from locations made as a result of actual discovery of mineral, could rarely be discriminated against. Failure to mark the limits of the claim in the case cited would be the only omission of serious import, as viewed in the light of California law, and the claimant could probably hold against all comers, at least so far as related to any lode approximately coincident with the lode-line claimed. Another locator posting a notice on a point of discovery outside the limits of the junior statutory claim, and on a distinct lode, might make good his pretensions to his vein up to the lode-line staked in the earlier imperfectly marked claim. Dispossession of a person having evidence to offer of prior actual occupation of the land, however, is repugnant to the principle of law, and to the spirit of the courts, and it is unlikely that judgment would lie against a claimant for imperfections in the details of his location.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Mining Claims on Forest Reserves.

The Editor:

Sir—I have read with great interest your editorial on mining claims within national forests in your issue of July 4. While I appreciate your earnest desire to promote the interests of legitimate mining development on the national forests, I feel that it is to be greatly regretted that statements without foundation in fact should be given the weight of authority by your publication. I have particular reference to the statement that no patents can be obtained to mill-sites within national forests. The Act of June 4, 1897 (30 Stat., 11) provides: "Nor shall anything herein prohibit any person from entering upon such forest reservations for all proper and lawful purposes, including that of prospecting, locating, and developing the mineral resources thereof: Provided, that such persons comply with the rules and regulations covering such forest reservations."

Even if any part of the Act of June 4, 1897, might be technically construed to prohibit the patenting of mill-sites within the national forests, the whole purview of the act is plainly in favor of a proper development of mineral resources. For this reason both the General Land Office and the Forest Service have, contrary to your intimation, construed the law liberally and have assisted bona fide claimants to secure patent to such lands in a large number of cases. Certainly there is nothing in the rules and regulations covering national forests which in any way prevent the patenting of mill-sites. I quote from page 49 of the 1908 edition of the Use Book containing the regulations and instructions for the use of the national forests: "In examining and reporting upon mill-sites, forest officers should keep in mind the following essentials of the law: Mill-site claims must not embrace more than 5 acres, and must be non-mineral and non-contiguous to a vein or lode, and must be used or occupied by the proprietor of such vein or lode for mining or milling purposes. The owners of a quartz mill or reduction works, not owning a mine in connection therewith, may also receive a patent for his mill-site." And again, from supplemental instructions issued forest officers: "Five acres of non-mineral land, not contiguous to the vein in a lode claim, may be embraced in a mineral application for such claim when such lands are used for mining or milling purposes in connection with the claim. Examples of such uses are the locations of mills, of bunk or eating houses for miners, of houses for the storage of implements used in developing the mine, or in the extraction of mineral from the ore."

I trust from these facts that you will appreciate how incorrect your statement is concerning mill-sites.

The Forest Service appreciates the necessity for intelligent examination of mining claims, and so far as the limited appropriations permit, experts for this purpose are employed. At present, twelve mining engineers, either graduates of well known mining schools or men with years of practical knowledge, and six geologists in co-operation with the United States Geological Survey are assigned to the mineral work on national forests. It is hoped to largely augment this force in the near future. It is the policy of the Forest Service to encourage the legitimate development of mineral resources in national forests. To this end it is the duty of forest officers to assist claimants who have made valid discovery and location in good faith; but it is equally important (and I am indeed glad to note that you have emphasized this point), in the interests both of the United States and bona fide miners, to secure the cancellation of fraudulent claims. Adverse efforts of forest officers are directed against claims which are apparently fraudulent, and you will certainly agree with me that no greater service could be rendered to legitimate mining than by protecting it against the exploitation of such claims. Although the General Land Office, and not the Forest Service, is vested with the power to pass upon claims, and, in so doing, necessarily construes the law, I believe that there is no difference between such construction in regard to lands within and those outside national forests. It is true that forest officers assist in investigating the facts of cases arising within the forests, but such investigation should, and I believe does, make the final decision more certain to be just. The interpretation of the law, however, is no more strict. In view of the great importance of the mining industry on national forests, the Forest Service welcomes your helpful criticism. I trust, however, because of the wide publicity given your editorial, and the consequent misunderstanding, that you will correct the misstatement noted.

WM. L. HALL,
Acting Forester.

Washington, D. C., July 16.

Sir—In a recent issue of the MINING AND SCIENTIFIC PRESS I note an article on 'Mining Claims on Forest Reserves' which contains several statements that are misleading and unfair to the Forest Service, and I request you to consider the following facts in relation to the position of the Forest Service in this matter. The statement is made that many mineral applications are examined and reported upon by rangers inexperienced and with no proper qualifications for the work. At this time all applications are examined by expert miners or geologists specially selected for the work, and every opportunity is given the applicant to show the character of the claim and the work done thereon. The mining laws as interpreted by the Land Office rule in all cases, and if these rulings are not always satisfactory to the claimant it is the fault of the laws and regulations and not of the Forest Service. You state, "there is now no provision for acquiring a patent title to a mill-site in a Forest Reserve." I quote you the instructions given on this subject in the Forest Service

Use Book for 1908, as follows. "In examining and reporting upon mill-sites, forest officers should keep in mind the following essentials of the law: Mill-site claims must not embrace more than 5 acres, and must be non-mineral and non-contiguous to a vein or lode, and must be used or occupied by the proprietor of such vein or lode for mining or milling purposes. The owners of a quartz mill or reduction works, not owning a mine in connection therewith, may also receive a patent for his mill-site."

As a Forest Supervisor I have never received any instructions contrary to the above, and you certainly have been misinformed in this instance. In connection with my duties I have reported favorably on applications for patent for mill-sites, and the Forester has approved my reports and passed the applications up to the General Land Office for patent. If this statement be doubted I can give specific cases to prove its accuracy.

There is no desire on the part of the Forest Service to cripple the mining industry in any manner, and all bona fide applications are carefully investigated and given fullest consideration, as it is recognized that the mining industry means much for the future of the West today as it has in the past. I believe if the men in charge of the national forests were given the opportunity to explain the policy of the Forest Service occasionally instead of hearsay statements being published without foundation, the policy of the Forest Service would be more fully understood by the people at large, and they would find that the national forests are created and administered to give the fullest use of all resources compatible with the permanent preservation of the same.

L. A. Barrett.

Plumas National Forest, Quincy, Cal., July 22.

Cornish Pumps.

The Editor:

Sir—If 'Old Timer' understood the air-chamber to have been applied to Cornish pumps operated by beam-engine, I can quite appreciate his gentle sarcasm in the selection of his signature from the article in your issue of May 2. 'Old Timer' is quite right; it would not be of advantage to put air-chambers on beam-engine-driven pumps, and I certainly would not recommend it. Mr. Herzig, in your issue of July 18, describes the effect of one application of the sort, and its failure. I have some of the indicator cards he mentions, and they surely indicate the fact that air is an elastic and resilient commodity. One or more portions of the pump declined to accept the treatment imposed on them by the fluctuating pressures in each separate down-stroke of the plunger and went out of business. In reply to the query as to why the small pipe-connection was made between the air-chamber and rising column, it may be replied that it was for the purpose of maintaining a regular or definite volume in the air-chamber. These were the pumps driven by the crank-shaft geared to the engine. It was found that the volume of air in the chambers was a fluctuating quantity, and the effect of fluctuation was that when the air-spring or cushion was too long, if I may so describe it, the water-column acted precisely as though it were resting on a long spring, and rose and fell, perhaps three or four times, during the down-stroke of the plunger, a distance of from 6 to 18 in. This was rather too violent for comfort, and the pump-man would have to go below and close off the charging-apparatus. After a time the air in the chamber would diminish in volume, and the pumps would begin to 'snap,' when the air-charging apparatus would have to be opened again. It was found that a certain height of air in the chamber was required to make the pump work as smoothly as desired, and this height being ascertained the chamber and rising column were tapped, and a small pipe connected. The charging-apparatus was then opened, and the excess of air passed through the small pipe, and the troubles of the pit-man from that source were over.

One feature of the application of the beam-engine pump at Lodden Valley interested some of the engineers who saw it. It had no balance bob. The pump-rod was estimated to have some excess-weight over the water-column, and while the exact weight of the rod was not known, about 3½ tons of cast-iron weight was added to the rod to cause it to act with enough promptness on the down-stroke to afford the desired number of strokes per minute. At the top of the shaft on the pump-discharge pipe was placed a tee, to the branch of which was bolted a valve from which a bend led to the discharge-race common to two 26 in. diam. crank-and-gear-driven plunger-pumps and the 24 in. diam. plunger and beam-engine pump. On top of the tee was bolted an extension of the discharge-column, forming simply a stand-pipe, open at the top. The overload on the rod had the effect of starting the downward stroke promptly. Now in order to gradually absorb or counteract the tendency to acceleration of the excess-weight before the lower end of the stroke was reached, the valve was partially closed and the water that was not discharged through the valve simply rose in the stand-pipe. The stand-pipe, 18 in. diam., being but slightly more than half the plunger area, responded more rapidly to the variation of head than had it been larger, the amount in any case being according to the adjustment of the valve, which need be changed only when desired to alter the rapidity of pump-action. This device controlled the action of the pump-rod rather nicely, the cycle of operation being as follows: the stroke of the 24-in. plunger being 8 ft. means a volume of about 150 imperial gallons passing up the discharge-column in say three and a half seconds; should the valve be now adjusted to pass 80 gal. in the three and a half seconds the other 70 gal. will rise in the stand-pipe, and during the remaining three and a half seconds will pass the valve, leaving the pipe empty for the next stroke. The operative effect will be readily understood when it is remembered that each added foot to the height of water in the discharge-column or stand-pipe means 196 lb. taken from the effective weight of the pump-rod and plunger. The stand-pipe was about 36 ft. high, and to close the valve entirely was to practically stop the pump.

In the letter in your issue of January 18 mention

was made of the comparative costs and economies of different pumps being determined by graphic analysis, and in extension of this a diagram is herewith submitted that shows in a graphic manner what many words would not entirely cover. It is a statement of estimates based on conditions of material-supply, labor, and operation, obtaining in the Deep Leads district of Victoria, Australia. Some familiarity with conditions there enables the writer to state that the diagram is an expression of the actual facts of cost and operation, subject only to such corrections as may be required to meet differences of location, installation, and operation, due to competitive or economic conditions. The efficiency or duty of each of the several pumps noted, excepting only the steam-pump, is based on actual everyday operation of the four types, all of which were running within 20 miles of each other. The expense of the steam-pump is based on the guarantee of a reputable pump-maker, and while it may be 'a bit fine' for everyday results it is important. The diagram was made up to simplify the decision on the selection of an installation to pump 2,500,000 imperial or 3,000,000 U. S. gal. per 24 hours from a mine 600 ft. deep. The total first-costs to purchase and install each of the plants is expressed in the nearest one thousand pounds sterling, and the diagonal lines, starting from the first-cost, indicate the additional cost for continuous operation during a period of five years.

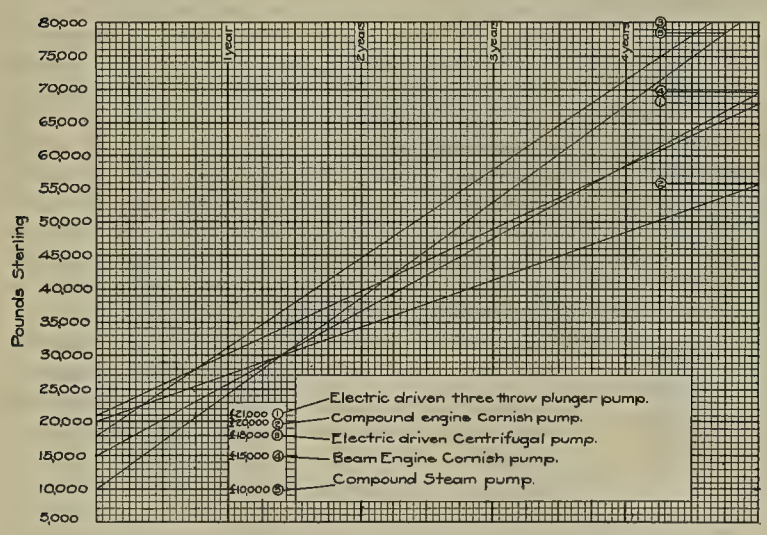


Diagram showing first costs and operating expenses for different pumps to raise 2,500,000 Imperial or 3,000,000 U.S. Gallons from a mine 600 feet deep.

As to efficiencies or duties of the several plants, upon which must be based all running-expense costs, it must be apparent that the most efficient is the most economical in the long run. The most economical plant that can be installed, is, so far as has been determined, one that is driven by high-duty, compound-engine, rope-drive connection to gear-train and crank-shaft, and connected to Cornish plunger-pumps by the usual sweep-rods, balance-bob, and pump-rods, similar to the installation described by Mr. Herzig in your issue of July 18, as having been put in the Berry United mine at Ullina. It should give a total combined efficiency of at least 80% from the throttle-valve of the engine to the water delivered at the pit-mouth, and do it every day of the year. By 'total combined efficiency' is meant that 2,500,000 imperial gal. per 24 hours raised 600 ft., represents 315 hp. of work done, and, at the efficiency named, the engine would indicate but 395 hp. At a 'total combined efficiency' of say 42½%, the appropriate percentage for an electric-driven centrifugal-pump of equal capacity, the engine would have to indicate 740 hp., or nearly twice as much fuel would have to be burnt in the boilers to keep the engine going. The 'erected costs' include everything to make a complete plant of the sort and style named, ready to run. As the principal item of cost used in making up this diagram, fuel is figured at 7s. 6d. per ton, and management, salaries, wages, repairs, and maintenance at a rate appropriate to the scale of development and operation calling for the installation of a pumping plant of such capacity. The steam engines, both for generator-plants and Cornish pumps, are set down as having a steam-consumption of 18 lb. per horse-power-hour. I am well aware that a better figure than this can be shown in a running test, and it is probably beaten in many large plants that are running on a commercial basis, but in a pumping plant in a mine, running day after day, stopping but one or two hours once a week for examination and adjustment, it will be found that 18 lb. of water evaporated per each indicated horse-power will not be too high. The fuel consumption of the beam-engine plant is placed at exactly the figure determined by the operation of three beam-engine plants in Victoria. It amounts practically to a fuel account of 13d. (26c.) per day per horse-power.

One centrifugal-pumping plant operated in Victoria did not give an efficiency of 42½%, nor anything like it. As a matter of fact, its 'total combined efficiency' was almost exactly 32%, and every 100 hp. of water delivered by this pump simply meant an expenditure of enough fuel to supply the generator-engine with steam to indicate 312 hp. The diagram will now afford intelligent comparisons. The cheapest plant to install is the steam-pump, but its total expense equals that of the most expensive plant to install in a little more than two years' operation. The beam-engine plant is the next cheapest to install, but its total expense equals that of the most economical in less than 18 months' operation. Note the difference in favor of the compound-engine-driven Cornish pump-plant at the end of say four years. It has run into a total expense of less than £49,000; the beam-engine plant £58,000; the steam-pump plant £67,500; and the electric-centrifugal £71,500. While this diagram illustrates certain conditions for which

it was specially intended, it will also serve as a guide in making comparisons based on other conditions, for the relations of one to another will remain practically the same. It must be modified by the different proportions of volume and lift, and by the percentage of charged expenses for pumping and other operations. The diagram will also illustrate rather clearly the kind of plant to be recommended. It scarcely need be said that where electric current can be generated by water-power and led to the mine at some much cheaper rate than it can be generated at the mine, there would be good reason for putting in centrifugal or geared pumps. In this case, then make comparison of the installation and operating expense of Cornish pumps, motor-driven, and in doing so, remember the high efficiency, about 90% of the water-ends of the latter against about 70%, at the outside, of the centrifugal.

E. P. Jones.

San Francisco, July 28.

A Farmer's Inquiry.

The Editor:

Sir—When my brother Ike got me to buy some mining stock for $3 a share a year ago he told me it was the chance of my life. He wrote that all the insiders were buying this treasury stock so that the company could build a mill, and when that was done big dividends would be paid. Ike wrote that I would be a fool not to use his tip. Well, I bought some stock and the mill was built, but I haven't made any money yet, and my $3 shares are down to 75c., though lately they have gone up a little. I have pretty near lost my faith in mining stocks. Of course I know Ike meant well by me. There's one thing I got out of it, and that's a nice annual report with plenty of figures and a pretty map. But I can't understand these figures very well, and I want to know if you, Mr. Editor, who seem to know everything and a little more, about mines and mills, won't help me in my trouble.

I find in the report a very plain statement that the mill worked 34,484 tons of ore out of which they made a profit of $165,788, and I am very glad to see this. But when I come to find out what they have on hand I see this item: "Estimated amount expended for development in advance of mining carried forward to next year, $50,000." Now I want to know if that does or doesn't cut into their profits for $50,000? Then I see they value their property at $3,000,000 and more, but that they only allow for a depreciation of $15,028, and this on their 'mine equipment,' which cost $45,117. They don't allow any depreciation for their mill, which cost $414,945. Is it a fact that mining equipments wear out and that mills last forever, as this seems to mean? Also I want to know if you think a firm of public certified accountants should pass a statement of this kind without making any comments on it? As the shares of this company are now selling for $1 on the market, or a value for the property of only $2,000,000, while the value on the books is $3,000,000 and over, would it not be a good plan for me to buy some more stock? It seems to me that even if I allow a large margin for shrinkage they can at any time sell their mines with its shafts and tunnels, all of which I judge are valuable from their system of valuation, for more than the $1 per share. Ike tells me that the mine is all right and will soon come out, and that the reason they have not done better is that the former managers probably made mistakes. He says all I have to do is to hold on. What do you advise me to do?

Joseph Bowers.

Huntsville, Missouri, July 20.

Professional Ethics.

The Editor:

Sir—Relative to the discussion of the proper ethical standard to be adhered to by engineers, I venture to suggest that unless the engineer himself maintains in his own private life and business relations the high standard that should be the rock-ribbed foundation of his reputation, no set of rules that can be prescribed can have much influence on either his good faith in dealing with his client, or the slowly-formed estimate of his character and ability that comes only through long scrutiny by the public. Without the foundation of character, no man will be honest except through fear, and this kind of honesty is worthless. A strong and clean personal character, inherently capable of discrimination between right and wrong, needs no written code. The engineer must be to some extent his clients' moral guardian, for, while no act of his own should inure to his benefit to the detriment, however remotely, of his clients' interest, it is hardly necessary to remark that in many cases the honest engineer, however strong the contrary influence, must decline to follow the course most agreeable to his clients' desires or financial profit. The function of the engineer must be judicial, and his attitude should be as free from personal bias or considerations of mere expediency as that of a justice on the bench.

Regarding mining reports, I believe the only safe and consistent course for an engineer who desires to remain above suspicion is to represent only the purchaser in the examination of a mine that is offered for sale. It seems to me well worth while for the engineer to rigidly refrain from anything in the way of mine-valuation except as the representative of the purchaser, or in consultation with an owner who has received an offer, and requires independent advice as to its acceptance. Aside from these two phases of mine-valuation, the function of the consulting mining engineer might properly be confined to advising on the development, equipment, and operation of mines and metallurgical works. This is a field broad enough for any man, whatever his ability or activities, and that embracing risky or even doubtful connection with the sale of mines or stock can well be entirely avoided and left to that class of practitioners having less scruples.

George Sydney Binckley.

Los Angeles, July 20.

The death rate of those employed in the mines and quarries of the United Kingdom during 1906 is officially given as 1.29 per thousand, as opposed to 3.21 in the United States.

CYANIDATION IN MEXICO.

Written for the Mining and Scientific Press
By Francis J. Hobson.

(*Continued From Page 160.*)

After it is determined that an ore is amenable to the process, the details of application become a mechanical and economical problem. In cyaniding concentrate, much stronger solutions or a much longer time of contact, is necessary than for treating sand, and for sand-treatment a longer time or stronger solution may be necessary than for the treatment of slime. Consequently few cases are conceivable where it is not advisable to make this classification before cyaniding. The prevention of a large mechanical loss of cyanide causes the use of a large bulk of weak solution in slime treatment. It is obvious that slime residue will be discharged with the same moisture, the contained solution being 0.01% KCy. Every ore is a problem in itself, and the adaptability of the process for it, can only be determined by a careful chemical and physical investigation. Many failures have been caused by merely imitating a neighbor's process and design of plant.

The chemical reactions on which the cyanide process rests for the extraction of silver from its ores, all lead to the formation of the double salt of cyanide of silver and potassium, $KAgCy_2$. The well known and accepted Elsner equation:

$$2Ag + 4KCy + O + H_2O = 2KAgCy_2 + 2KOH$$

can only apply to the solution of metallic silver. In dissolving argentite, Ag_2S, the most common occurrence of soluble silver, I am of the opinion that the following reaction takes place:

$$Ag_2S + 5KCy + O + H_2O = 2KAgCy_2 + KCyS + 2KOH.$$

This belief is substantiated by the fact that potassium thiocyanate, KCyS, is always found in mill-solution. I am of the opinion that soluble sulphides (also always present), are formed by the combination of free hydro-sulphuric acid, H_2S, with the free or liberated alkaline hydrates, and by the action of alkaline hydrates on base-metal sulphides. In most cases the H_2S has been formed in the ore-charges before being brought in contact with the solutions.

Mine water is often necessarily utilized for milling purposes. It generally contains some free hydro-sulphuric acid. The gas from this source, as well as that generated in the ore-charges by the action of free sulphuric acid on the base-metal sulphides, combines with the free cyanide of potassium and the free alkaline hydrates to form both thiocyanate and sulphide of potassium. When zinc is used as a precipitant, soluble sulphides are mostly removed from solution by precipitating zinc sulphide, ZnS, and regenerating cyanide of potassium:

$$K_2ZnCy_4 + K_2S = 4KCy + ZnS.$$

Any excess can be removed by the addition of lead acetate:

$$Pb(CH_3CO_2)_2 + 2KCy + 2H_2O = 2KCH_3CO_2 + Pb(OH)_2 + 2HCy,$$

and

$$Pb(OH)_2 + K_2S = PbS + 2KOH.$$

The precipitated sulphides are discharged with treated residues. Some silver is always precipitated in the zinc-boxes as sulphide, at times enough to cause trouble in melting the precipitate. Mercurous potassic cyanide, $KHgCy_2$, dissolves silver sulphide as follows:

$$Ag_2S + 2KHgCy_2 = 2KAgCy_2 + Hg_2S.$$

The salt is very unstable, and must be protected in solution in its mercurous state by the presence of some reducing agent, such as ferrocyanide of potassium. The latter salt is generally present in mill-solution, and consequently need not be added in practice. Mercurous potassic cyanide, in the presence of free alkaline hydrates, also readily dissolves stephanite, Ag_5S_4Sb, pyrargyrite, Ag_3S_3Sb, and proustite, Ag_3S_3As. I am of the opinion that the reactions taking place in this solution are as illustrated by the following equations:

$$2(5Ag_2S,Sb_2S_3) + 20KHgCy_2 + 4Ca(OH)_2 = 20KAgCy_2 + 10Hg_2S + Ca_3(SbS_3)_2 + Ca(SbO_2)_2 + 4H_2O$$

and

$$2(3Ag_2S,Sb_2S_3) + 12KHgCy_2 + 4Ca(OH)_2 = 12KAgCy_2 + 6Hg_2S + Ca_3(SbS_3)_2 + Ca(SbO_2)_2 + 4H_2O$$

and

$$2(3Ag_2S,As_2S_3) + 12KHgCy_2 + 4Ca(OH)_2 = 12KAgCy_2 + 6Hg_2S + Ca_3(AsS_3)_2 + Ca(AsO_2)_2 + 4H_2O.$$

The formation of the salt $KHgCy_2$ in practice is best made by adding calomel, Hg_2Cl_2, to the cyanide solution:

$$4KCy + Hg_2Cl_2 = 2KHgCy_2 + 2KCl.$$

In the absence of free ferrocyanide of potassium, or other reducing agent, mercuric potassic cyanide is formed and metallic mercury precipitated:

$$4KCy + Hg_2Cl_2 = K_2HgCy_4 + 2KCl + Hg.$$

In ordinary practice the ore is first subjected to treatment with solutions of potassium or sodium cyanide until all or about all of the possible extraction has been obtained; then mercurous chloride is added and the treatment continued to the end. The only serious interferences I have encountered in the use of mercurous potassium cyanide, are manganic compounds. They immediately oxidize it to a mercuric salt, destroying its usefulness as a solvent. The salt does not dissolve gold. Its use is covered by letters patent in the United States and foreign countries.

When there is enough ferrous iron in the ore to cause a serious interference, the salt is best formed by adding mercuric chloride to the mill solution:

$$K_4FeCy_6 + 2HgCl_2 = Hg_2FeCy_6 + 4KCl$$

and

$$Hg_2FeCy_6 + 2KCy = KHgFeCy_6 + KHgCy_2.$$

The addition of the mercuric salt serves the double purpose of converting the interfering ferrous salt to non-interfering ferric salt, and the generation of the solvent $KHgCy_2$.

An investigation of a case of solution fouled by ferrous iron led to the discovery of mercurous potassic cyanide as a silver solvent. The ore in question contained from 2 to 3% ferrous oxide, an interference that could not be removed by preliminary alka-

line washes. New solutions on this ore yielded 80% extraction of the silver. The second use of the solution gave 65% extraction, a third 50%, and a fourth 30%. Further use of the solution continued to give this latter extraction. The solution became heavily charged with ferrocyanides of potassium, zinc, cadmium, and other metals which coated the zinc in the boxes and prevented precipitation. Mercuric chloride was added to the mill-solution, as an experiment, with the idea of changing the ferrocyanide to a ferric salt. The remedy was a success, and the silver extraction was raised to 92%, creating the belief that a more active silver solvent than cyanide of potassium had been formed. Careful laboratory investigation confirmed the belief that the more active solvent was mercurous potassic cyanide.

Prominent features demonstrated by further tests on ore containing silver as argentite, proustite, and pyrargyrite, were as follows:

(1) The chemical equivalents in solution necessary for the reaction

$$Hg_2Cl_2 + 4KCy = 2KHgCy_2 + 2KCl$$

sufficient to make a 0.5% solution $KHgCy_2$ applied to silver-gold ore, plus 0.5% slaked lime, gave practically no silver extraction, and 30% gold extraction, demonstrating the necessity of ferrocyanide of potassium or some other reducing agent to prevent the formation of mercuric cyanide and the precipitation of metallic mercury. The gold extracted was probably dissolved by the mercuric potassic cyanide formed.

(2) The same mixture, with 0.2% free K_4FeCy_6 in solution, gave 86% silver and no gold extraction, proving the efficiency of a protective reducing agent, and that $KHgCy_2$ is not a solvent for gold.

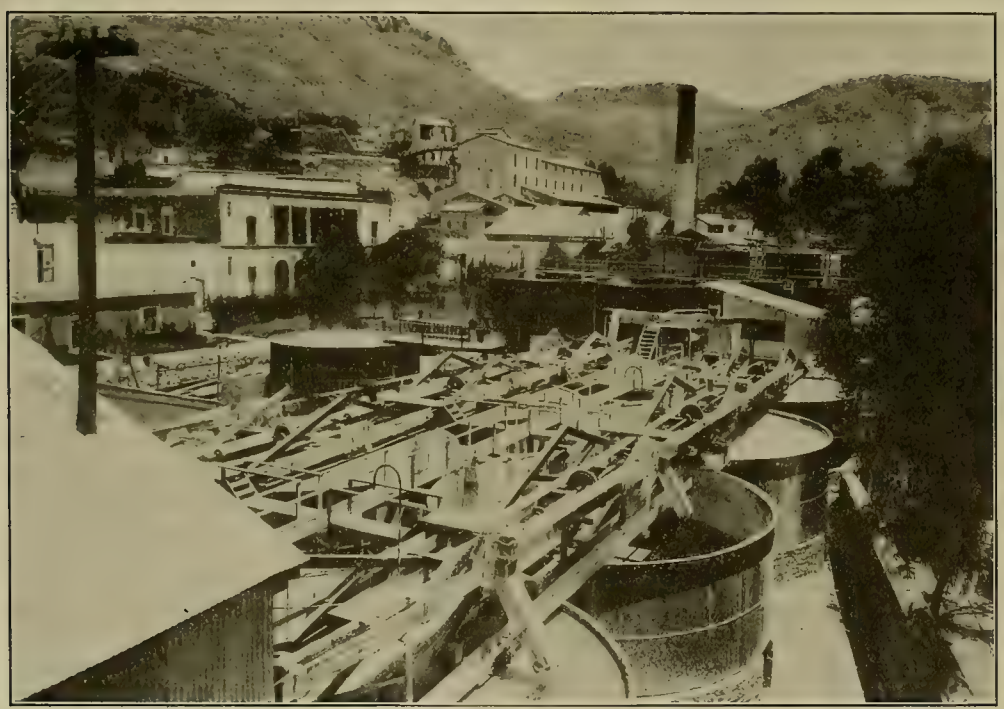
(3) A mixture in solution of K_4FeCy_6 and $HgCl_2$, sufficient to make 0.3% $KHgCy_2$ by the equation already given, plus 0.2% free K_4FeCy_6, plus 0.2% KCy, gave 85% silver extraction and 80% gold extraction, proving that free KCy is necessary for dissolving gold, and strengthening the belief that the reactions previously given for solution of antimonial and of arsenical silver are correct, and proving also that the presence of ferrocyanide of potassium retards the solution of gold. For this reason, in practice ores are first subjected to treatment with plain KCy solution.

(4) A 0.5% KCy solution applied to the same ore gave 51% silver extraction and 90% gold extraction, proving that arsenical and antimonial silver ores are but slowly, if at all, dissolved by cyanide of potassium, and that a solvent for these is formed by adding mercurous chloride to potassium cyanide solution in the presence of free ferrocyanide of potassium.

(5) A 0.2% KCy solution gave 32% silver and 90% gold extraction.

(6) A mixture of K_4FeCy_6 with either $HgCl_2$ or Hg_2Cl_2 did not make a silver solvent, negatively showing the probability of the correctness of the reactions given for the formation of mercurous potassic cyanide, when adding mercuric chloride to a solution of cyanide and ferrocyanide of potassium.

(7) Experiments, conditions being same as in third test except that no lime was added, on pulp which had been thoroughly washed with distilled water, gave 43% silver and 90% gold extraction, corroborating belief in the correctness of the reactions given for the solution of arsenical and antimonial silver.



Hacienda San Francisco de Pastita.

The time of treatment, quantity of solution, and amount of lime, $Ca(OH)_2$, added in each experiment was the same. The tests were repeated several times, and the results given are the averages of all the experiments. The use of mercurous potassic cyanide at the Peregrina 440-ton plant increases the silver extraction approximately 15%. Commercially, the return is $1 for 12 cents.

A careful study of the various base-metal and cyanogen compounds in mill solutions, will enable the chemist to improve extractions and to lower the cost of treatment. Almost invariably the double salts of cyanide of potassium, sodium, and calcium, with zinc, ferric and ferrous iron, are present, and generally the salts of aluminum, magnesium, manganese, and of other base-metals. Ferrous iron combines with cyanide of potassium to form ferrocyanide of potassium, and this forms, with the soluble salts of aluminum, cadmium, zinc, calcium, and ferrous iron, white precipitates, $Al_2(OH)_2$, Cd_2FeCy_6, Zn_2FeCy_6, $K_2CaFeCy_6$, and $K_2Fe_2Cy_6$, all of which pass the filter-cloths, or are decanted with the solutions, and collect in the zinc-boxes, coat the shavings, and prevent precipitation. As before mentioned mercuric chloride added to mill solutions changes interfering ferrous to a non-interfering ferric salt, and prevents the formation of aluminum hydrate, ferrocyanide of zinc, cadmium, calcium, iron, and so forth.

A number of methods for determining ferrocyanide of potassium in solution are given in the text books, but I have found none of them accurate. The following method has given good results in practice: to an aliquot part of the solution is added just enough silver nitrate to neutralize the free cyanide of potassium, then mercuric chloride is added to excess, and the iron is determined in the well-washed precipitate. This is done by bringing the precipitate into solution with aqua regia, boiling off the nitric acid, and removing the mercury from solution with H_2S. After the removal of the excess of H_2S, nitric acid is added to the solution and the iron is precipitated with ammonia. The process is somewhat tedious but accurate.

In practice mercuric chloride is added to the solution in the proportion of eight to one of ferrous iron as Fe when it is necessary to transpose all ferrocyanide present. Mercuric chloride does not precipitate ferric iron. Aluminum and magnesium salts react as acids, precipitating their hydroxides, Al_2O_3 and MgO, in the presence of free calcium hydrate, cyanide of calcium being formed:

$$Al_23(SO_4) + 6KCy + 3H_2O = Al_2O_3 + 3K_2SO_4 + 6HCy$$

$$MgSO_4 + 2KCy + H_2O = MgO + K_2SO_4 + 2HCy$$

$$2HCy + Ca(OH)_2 = CaCy_2 + 2H_2O.$$

Manganous salts precipitate manganese cyanide, $MnCy_2$, which forms with cyanide of potassium the double salt K_2MnCy_4, decomposed by calcium hydrate, precipitating the hydroxide $Mn(OH)_2$:

$$K_2MnCy_4 + 2Ca(OH)_2 = Mn(OH)_2 + 2CaCy_2 + 2KOH.$$

Ferrocyanide of potassium precipitates a white ferrocyanide of manganese which acts similarly to the ferrocyanides before mentioned. The double salt of potassium and manganese is also changed in solution to manganicyanide, with oxidation of a portion of the manganese:

$$12K_2MnCy_4 + 3O_2 + 2H_2O = 4K_6Mn_2Cy_{12} + 2Mn_2O_2(OH)_2.$$

Ferricyanides precipitate manganous ferricyanide, $Mn_3Fe_2Cy_{12}$. Where silver occurs in any of the forms soluble in cyanide of potassium, calcium hydrate added to excess efficiently overcomes the interference. In the absence of an excess of calcium hydrate, a number of manganese compounds are formed, which obstruct the solution-conduits with complex many-colored manganese precipitates, and at times form manganate and permanganate sufficient to color the mill solutions. Manganic salts rapidly oxidize mercurous potassic cyanide to a mercuric condition, destroying its usefulness as a solvent; consequently it cannot be utilized on ores containing any appreciable amount of manganese.

The only reliable test for available cyanide in the mill solution, is titration with nitrate of silver without the use of the iodide indicator.

A very good method for determining gold and silver in solution is precipitation with cuprous chloride. To an aliquot part of solution is added an excess of cupric sulphate and then hydrochloric acid. After one or two minutes agitation the precipitate is collected on a filter paper, and is run in a crucible for gold and silver in the usual maner. This method was suggested by S. B. Christy, of the University of California, in an article read before the American Institute of Mining Engineers, Vol. 26, 1896. It was afterward published, I think in 1901, by Walter H. Virgoe in a paper read before the Institute of Mining and Metallurgy of London. The method is practically accurate for both gold and silver without the addition of sodium sulphite. A modification of the method is precipitation by adding excess of saturated solution of copper sulphate plus 5% free sulphuric acid. This gives practically perfect precipitation of both gold and silver. Freshly precipitated copper sulphide added to an acidified cyanide solution precipitates both gold and silver completely if the solution does not contain more than 0.1% hydrocyanic acid. The advantage of any of the three methods given is that they may be applied to a large bulk of solution, and the whole operation completed within one hour. An excess of any of the alkaline sulphides completely precipitates silver from the cyanide solution.

The chemistry of the zinc-box is only interesting when mill solution is allowed to foul, a condition incompatible with successful cyaniding. With comparatively clean solution, no troubles are encountered in precipitating silver, excepting from those containing an appreciable amount of copper. In that case it is advisable to precipitate the copper on a heavy zinc-lead couple (in separate boxes) before precipitating the silver.

Petroleum containing 86% carbon has an evaporative power of 18 lb. of water per pound of petroleum.

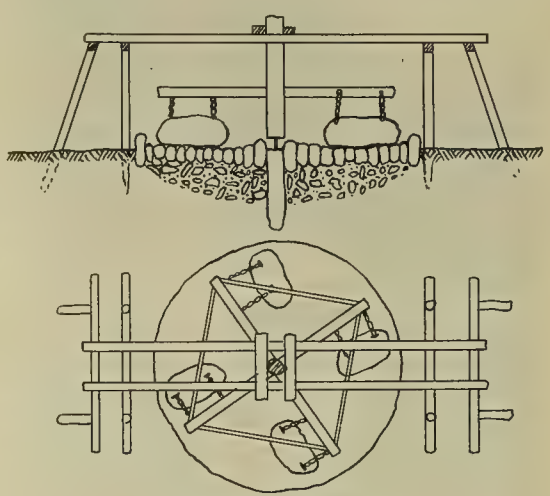
INEXPENSIVE HOME-MADE 20-TON MILL.

Written for the Mining and Scientific Press
By Teodoro Köhncke.

The mill herein described was built in Central America to treat ore overlooked by former operators as well as the dump-sortings at one of those old abandoned mines known as *antiguas*. Not enough ore was in sight in the mine, which was mostly caved, to warrant the erection of an expensive modern mill. The plant was originally put in to treat a gross known quantity of only about 2000 tons. In the meantime it was hoped to develop additional orebodies. The total cost of the entire plant, exclusive of superintendence, was $2400, made up as follows: tools and supplies brought from the United States, $650; lumber, $225; labor, $1050; freight, $175; miscellaneous, $300. Labor costs were: skilled labor, $1, and unskilled labor 40 to 50c. per day. Lumber was whip-sawed by contract at a cost of $28 per thousand feet. These prices are in terms of United States gold. The mine is situated 65 miles from the coast, and the only communication is by means of pack-mules. This did not prove a great handicap, however, as but little material was brought in.

The site of an old *beneficio* was chosen in order to use a water-ditch built by the early workers, as well as the foundations for the water-wheel. Gearing, shafting, pinions, and various kinds of iron were obtained from an abandoned pan-amalgamation mill 40 miles away, at little cost beyond that of transportation. A 20 by 4 ft. overshot water-wheel was used to get power for the 16-ft. *arrastre*. The shafting on the water-wheel was carried out 24 ft. to one side, and a pinion placed on the end which meshes with a gear-wheel on top of the *arrastre* hub. The gear and pinion were obtained from an old settling-pan. On building the *arrastre*, a hole 18 ft. diam., with the centre exactly beneath the pinion on the wheel-shaft, was dug 2½ ft. deep. This was filled 1½ ft. high with rocks and mortar, except in the centre, where a post of hard oak 15 in. thick was sunk 3 ft. deep. This foundation sloped slightly from the outside toward the centre. Over the foundation was put a coating of cement, care being taken to have it water-tight. Next, about 3 in. of dry sand was laid over the cement-floor, and the paving begun. For the paving, flat stones 8 to 10 in. thick were used. These were well wedged, the smaller cracks being tightly filled with hard-wood wedges. On the outside edge, and against the centre post, the pavement was a little higher than elsewhere. This keeps the pulp beneath the muller.. The sand makes it easier to get a level floor, takes the jar off the foundation, and catches anything that comes through the pavement. When the pavement is changed the sand is washed for gold and amalgam, and fresh sand is put in.

The centre post stood up about 8 in. above the floor-level, and was fitted with a step-block from a settling-pan. The hub used was an 18-in. oak-log, with a pin let in the bottom that fitted the step-block, this serving as a pivot. Oak arms, 6 by 6 in., were run through the hub at right angles to each other, and were braced from the end of one to that of the following arm. On top of the hub a gear-wheel was clamped by the spokes to the sides of the log, care being taken to have the gear well centred. A pin similar to that in the bottom of the hub, but longer, was let in the centre. This was caught in boxing from above, and served as a steadier. The gear meshed with the pinion on the water-wheel shaft. To carry the two boxings, two 6 by 8 in. timbers were laid across the *arrastre* on bents, high enough to clear the gearing. A wall was next built around the edge of the *arrastre*, 1 ft. thick, and 1½ ft. high, leaving a gap 6 ft. long in front, for the screens. Wooden sills were put in this gap to hold the frames and launders. The bottom of the wall was let into the foundation and the lower inside portion was given a cement-coating to prevent leakage. An 8-ft. copper plate, placed a few inches above the ground, took the pulp from the screen-launders. From the plate the pulp went to three spitzkasten.



Details of an Arrastre.

While erecting the *arrastre* pine lumber was being framed for three 16-ft. leaching-vats, two 12-ft. settlers, two 8 by 8 by 7 ft. stock-solution vats, a sump vat, and a gold-solution vat. All the vats were square, and, because of the scarcity of stay-rods, barbed wire, doubled several times, was used. The wire was run through holes in strap-iron, and wedges were driven through the loops to tighten the wire. Putting in the pipe-fittings was a difficult piece of work, owing to part of the pipe being old and worn, and as everything had to be cut and threaded by hand, the work was very tedious. From the plates the pulp was run into three spitzkasten, the coarse from these going direct to the leaching-vats, and the overflow to the settling-vats. This slime was stored until such time as it would be practicable to treat it. When once adjusted and in running order, 20 tons daily was crushed and treated. The ore was a granular rock, which broke down quite easily under the muller. Averages of 25 working days per month were made for the first six months, the chief cause of delay being the changing

of muller-stones and pavement blocks. The mullers lasted from two to four weeks, and the pavement from two to three months. Two heavy and two light stones were used as mullers, the former weighing from 1000 to 1400 lb., and the latter from 800 to 1000 lb. The entire plant was installed and running in good shape in five months from the time when construction started. To have bought a milling plant of equal capacity would have cost, with freight and construction charges, $20,000, and while a modern mill possibly could have been run at a slightly lower cost per ton of ore treated, and would, of course, last much longer, still it would have to treat a great many thousand tons to make up for the difference in cost. In operation but one man was necessary to look after the *arrastre*-plant, so that the cost of superintendence was very low for a plant of such limited capacity.

At many mines, where no custom mills are at hand, and where the ore is not available in sufficient quantity to warrant the installation of modern equipment, plants of the type of the *arrastre* described could be used to advantage. The low initial cost, and the ease of construction, bring them within reach of comparatively poor men. Only ordinary ability and ingenuity are needed to erect a plant of this kind, which will often produce enough to properly equip a mine, when subsequent development shall warrant it.

BAUXITE.

The production of bauxite in the United States in 1907, according to the U. S. Geological Survey, amounted to 97,776 long tons, valued at $480,330. This is an increase of 22,444 tons, or almost 30 per cent over the production of the year before, and an increase in value of $112,019, or a little over 30%. The average price of the material at the mines was about $4.91 per long ton, an advance of but 2c. over the returns for 1906. It has recently been claimed that a source of aluminum might be found in India, where thousands of square miles are covered with deposits of aluminous laterite. True laterite is essentially a mixture of iron hydrate, aluminum hydrate, and free silica in varying proportions. It is identical in type with bauxite, being merely a ferruginous variety of the latter. By diminution in the iron oxide and corresponding increase in the alumina, laterite merges into bauxite. Between bauxite on the one hand and limonite on the other, all sorts of mixtures may occur. In India laterite is reported as derived in part from rocks in place, as is the case with our Arkansas bauxite deposits, or as having been transported. The high-level laterites of India are said to bear a striking resemblance to bauxite. The chief uses of bauxite are:

1. As raw material in the production of metallic aluminum, which is by far its most important use. A large part of the output of the State of Arkansas has been devoted to this purpose, and the production from this State has shown remarkable growth during the past few years.

2. In the manufacture of aluminum salts. A large part of the Georgia-Alabama product is used for this purpose, owing to its relative freedom from oxide of iron.

3. In the manufacture of artificial abrasives (alundum).

4. In the manufacture of bauxite brick. This last use in refractory brick is of recent date. The bricks are of chief value in resisting the corrosive action of molten metal at high temperatures, and hence are applied in basic open-hearth steel furnaces, in furnaces for refining lead, in copper reverberatory furnaces, and in the linings of rotary portland-cement kilns. In the manufacture of the brick[1] the bauxite is first washed to remove free silica and then calcined at a temperature of 2500°F. Very little or no shrinkage takes place below the temperature of 2390°, hence 2500° is about the lowest safe temperature that may be applied. The calcined material may be bonded with plastic fire clay, sodium silicate, or free lime, and the bricks, after drying, are burned in down-draft kilns at high temperatures, such treatment rendering them hard and tough. A 9 by 2½ by 4½ in. brick, weighing 7½ lb., has been found to stand a crushing test of 10,000 lb. per sq. in. For open-hearth steel furnaces a high alumina and low silica brick is essential, and the purer the alumina, the more satisfactory the results. The pisolites or small rounded concretions are found more satisfactory for this purpose, as they carry a higher content of alumina than the other grades of bauxite. This material is obtained by selecting, washing, and sifting the purest bauxite at the mine. The finer material, containing the greater part of the silica, passes through the sieve and is rejected. Recent tests have shown that bricks containing less than 12% silica would be satisfactory, and that in open-hearth steel furnaces they withstand the corrosive action of the metal and basic slag as well as magnesite bricks. The reason for this resistance may be due wholly or in part to the fact observed by Sir William Siemens that bauxite, when subjected to the intense heat of the furnaces, is converted into a solid mass of emery, so hard as to be scarcely affected by steel tools and able to resist mechanical, calorific, and chemical action. As a lining in rotary portland-cement kilns, bauxite bricks are giving satisfaction. They are soft enough to allow a coat of the cement to stick to them and thus protect them, lengthening their term of use, and still not soft enough to allow any part of the bricks to be pulled away. Only a small part of the kiln need be lined with the brick, namely, the hot zone 10 to 12 ft. long in a 60-ft. rotary kiln. The most recent applications of bauxite brick are in the lining of lead-refining and copper reverbartory furnaces. During the process of lead-refining the scum which rises to the surface is composed for the most part of basic oxides which attack the silica in ordinary fire-brick linings. The use of bauxite brick largely composed of basic oxide has reduced the tendency to reaction with consequent increased duration of life to the furnace lining. It has been estimated that bauxite brick lasts five to six times as long as ordinary silicious fire-brick.

[1] A. J. Aubrey, 'Mineral Industry,' Vol. 14, 1906, pp. 48-51.

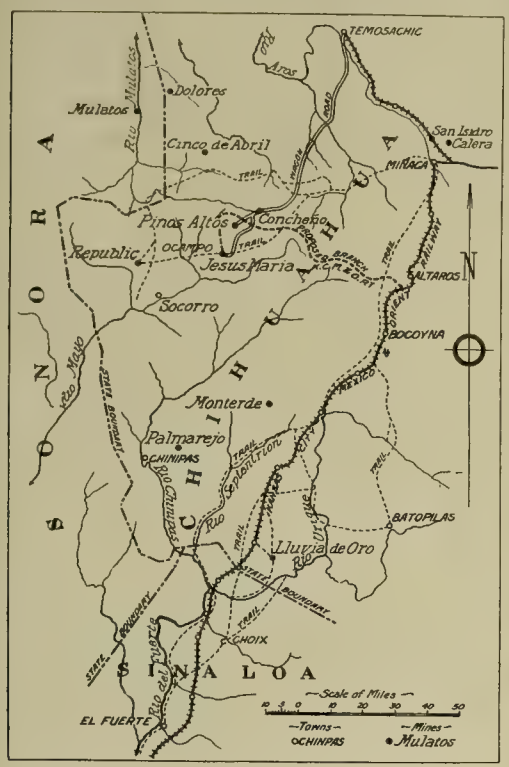
GEOLOGY OF THE MINING DISTRICTS OF CHIHUAHUA, MEXICO.

Written for the MINING AND SCIENTIFIC PRESS
By RUFUS M. BAGG, JR.

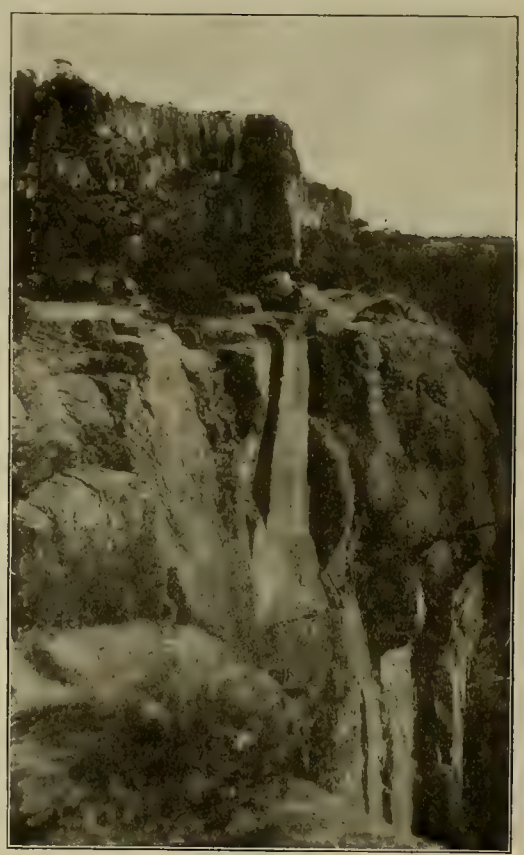
(*Continued From Page 153.*)

Geologists visiting Mexico cannot fail to be impressed with the following facts:

First, the remarkable richness and extent of the Mexican ore deposits. Both in Chihuahua and elsewhere this is seen over and over again. For example, there is one quartz vein, the Rosario, in the Guadalupe y Calvo district, which varies from 60 to 150 ft. across, and where measured by Mr. Weed was 110 ft. wide. Again, at the Palmilla mine near Parral the orebody is 20 ft. wide at a depth of 75 ft., 40 ft.



Map of Southwestern Chihuahua.



Escarpment Along Rhyolite Dike.

wide at the 400-ft. level, and is said to be 185 ft. in maximum width at the 600-ft. level.

Second, the great distance between the mining centres. This is well illustrated in Monterde. Forty miles west lies Guazapares with its quartz veins; 40 miles north of Monterde lies Uruáchic, a large and still active camp, producing gold, silver, and some copper; 40 miles east lies Maguaríchic with its narrow fissure-veins yielding gold and silver. A little farther south lies Urique, one of the oldest and best known gold-silver camps of western Chihuahua. It is a well known fact that in many areas mines occur along mineralized zones which represent lines of structural differences and deformation, but in this case the deposits are in widely separated areas, and on unconnected mountain ranges.

Thirdly, the serious difficulties, chiefly due to lack of transportation facilities, which attend the profitable working of many large and important deposits.

The ore deposits of Chihuahua may be broadly grouped into three types:

First, deposits in solution-chambers in sedimentary rocks, chiefly limestone. These are of course of secondary origin, and the minerals are as usual, silver, silver-lead, copper, and zinc.

Second, ore deposits occupying true fissures, usually quartz veins in an igneous matrix.

Third, ore deposits in fault-zones and in zones of shearing.

Deposits in solution chambers constitute a very common type. The Rio Tinto and adjoining mines at Terrazas, 25 miles north of Chihuahua, have yielded considerable copper ore which was taken from chambers filled with chalcopyrite, cuprite, some malachite, and chrysocolla, in a highly fractured limestone, traversed by small intersecting faults, and with the solution-chambers relatively small below the first 100 ft. The characteristic gossan of iron-ore is found here, and has been of service in fluxing the copper-ore which is treated at the mine in two small furnaces. A porphyritic dike, probably of andesite, cuts through the western slope of the hill, and has metamorphosed the limestone along its contact into a massive garnet-rock. A second example of this type is well exemplified by many mines in the long-famous Santa Eulalia camp. This deposit was discovered in 1703, and its mines have been worked for silver and lead almost continuously to the present day. The camp has no water-supply available and

its development has been dependent upon Chihuahua, where two streams, the Chubiscar and the Rio de Dios, were able to furnish water for the reduction of the ores. El Caballo was the first property opened, and this mine, together with the San Marcos, La Vieja, Dolores, and San José, produced those extraordinary treasures which made the region noted at the beginning of the eighteenth century as one of the richest silver districts in the world.† The amount of ore which has been stolen from this camp, together with that which has been legitimately mined but never reported for taxes, will of course never be known, but the records show that from 1705, two years after the discovery of the mines, down to 1884, Santa Eulalia yielded 111,590 bars of silver, having a value of $120,634,585. Since 1884 the mines have been producing much more heavily, and the present monthly shipments to El Paso are approximately 20,000 tons of ores of silver, silver-lead, and zinc. Solution-deposits are also finely developed in the Cerro of Almoloya. This mountain lies between Jimenez and Parral, on the Mexican Central railroad, nine miles south of the little station of Baca on the Parral branch. It is an outlier of Mesozoic (Cretaceous?) limestone, about ten miles long, three or four wide, and stands 1000 ft. above the surrounding plain. The limestone is of two types, one blue and the other gray or white, and the solution-chambers occur in both series. The ores are found principally on the lower north slope and also high up on the mountain-side. There is also a gold mine on the southwest slope. The ores carry silver, copper, zinc, and gold, and all producing mines are situated within a radius of three miles or less. The zinc mine lies above and to the south of the great Cigarrero copper-silver property, and has chambers of ore from 10 to 20 ft. wide, filled with solid smithsonite. Some of the ore is beautifully straticulate vertically and carries occasional bunches of pale green auri-calcite, a rare copper-zinc mineral. On the crest of the mountain the limestone is thickly bored full of holes extending downward to unknown depths in the limestone. These holes vary in size from an inch to a foot or more in diameter. They are supposed to be the lines of ancient drainage connected with the solution-chambers. Fault-planes are pronounced, and have been a further aid in the mineralization of the limestone.

Deposits in fissures are very plentiful in the Chihuahua mountains. In this class are included only the vein-deposits occupying original fissures without subsequent movement. There is another group of faulted fissures which have had a double origin, and the majority of the mines in these belong to the third group. Most of the pronounced fissure-veins, however, show some evidence of movement either as horizontal shear or as vertical thrust, since they are the lines of greatest weakness in the rock-mass where they exist. In a highly mineralized region where fissure-veins are abundant, as, for example, at Ocampo (Jesus Maria), some of the fissure-veins are undisturbed, with their quartz vein-filling 'frozen' tightly to the country rock, while other veins not far distant may be greatly faulted. The La Cruz mine, six miles west of Ocampo, is an example of a faulted fissure, belonging, therefore, to the third class. Here the condition is more complicated than usual, owing to the intrusion of an andesite dike 28 ft. wide, and highly impregnated throughout its entire width with minute crystals of dodecahedral and cubic pyrite. Slight movements along a fissure-vein will more readily develop slickensides on the lower or foot-wall side than on the hanging-wall side. It is certainly true that in a number of deposits in Chihuahua belonging to this class, the hanging-wall side is more irregular, more frequently frozen to the country rock, and the ore is of lower grade than in the foot-wall side. The La República mine, southwest of Sahuayacán, has a solid quartz vein 6 ft. wide in all its workings, averaging 110 oz. silver per ton (no gold) that is highly mineralized with ruby silver and other silver sulphides throughout its quartz vein-filling. The vein dips sharply under the creek in which the mine occurs and on its foot-wall often carries seams of native silver, evidently a result of precipitation from the original sulpho-salts.

The mining centres in and around Ocampo afford many excellent examples of true fissure-veins. The camp was discovered in 1821 when the San Antonio mine was opened. Some of the more important mines are the Santa Juliana, which has produced upward of ₱100,000,000; the Santa Eduwiges, which in seven years, 1838-1845, had a production record of ₱5,000,000; and the Watterson gold mine, which is still producing about 100 tons of high-grade gold ore daily. The Concheño mine, six miles north by east, has a 60-stamp mill, and has been producing upward of half a million annually. It has now been taken over by the Greene Gold-Silver Co., and will be worked on a larger scale. This vein is pronounced and its orebodies are wide, though the ore is low-grade. The workings have reached a depth of 1000 ft. The country rock, in addition to sedimentaries, around Ocampo and Concheño consists of rhyolite, andesite, diabase, volcanic breccia, and rhyolite tuff. All are highly silicious, and the vein-filling is invariably quartz, carrying both gold and silver. The veins have in many instances been worked to water-level, and the old workings still exist with their walls running up the mountain side, while the lower portions are being uncovered and developed by American capital.

Similar fissure-veins occur at Sahuayacán and at El Pilár, two days' journey by mule-back west of Ocampo. Two sharp volcanic cones, apparently rhyolite, rise here to great height, the most imposing of which, El Pilár, having upon its base the mining camp of Socorro. Both these buttes represent volcanic necks from which radiate many fissure-veins, quite narrow but of great length, and yielding high assay-values in both silver and gold. The gold is frequently visible to the naked eye, while the silver is usually in the form of pyrargyrite, proustite, and the brittle silver, stephanite. More rarely the simple sulphide, argentite, is found.

Ore deposits in fault and shear-zones are developed

† Santiago, Ramírez. Noticia Historica de la Riqueza Minera. México, 1887.

in zones where the fracturing is pronounced and the movement extensive. Such deposits have the following characteristics in Chihuahua: (1) The ore is developed in elongated irregular lenses or pockets, separated by lean or barren portions. The amount of disturbance which the magma has suffered since fracture took place has a direct relation to the irregularity, extent, and amount of ore present. (2) There are certain zones of enrichment in such deposits, and these are sometimes developed in the wider part of the vein instead of at its narrower portions. (3) Such deposits are not all developed vertically downward, but pitch in a given direction, and since such ores are irregular it is often necessary to sink on wide lenses, and to cross-cut at close intervals in order to thoroughly explore all the mineral ground along the faulted area. The widest orebodies are of course typically developed where the vertical disturbance has been accentuated by horizontal shear.

The best illustrations of this type of deposit are seen in the La Reina mine, seven miles south of Cusihuiriáchic. The vein trending northeast-southwest has been sheared and slickensided on an extensive scale. It is from 6 to 20 ft. wide and is opened to a depth of about 400 ft. It is producing about ₱20,000 per month. On the lowest level a branch from the main vein extends in a long curve away from and then toward the big vein, and is apparently separated from this by an immense 'horse,' several hundred feet long. It is about two feet wide and carries large amounts of silver chloride and bromide.

Five miles east of the Sinaloa boundary, in the extreme southwest part of the State is another example of this type of deposit in the Lluvia de Oro mine, which has been lately described by R. H. Burrows.[1] He states: "The orebodies occur in a bed of limestone which outcrops as a bold cliff along the east face of the ridge, and which has suffered extreme faulting and fracturing, the mineralized area having been mineralized about 2500 ft. by the intrusion of a body of diabase, the latter now forming the underlying rock of the district."

The following section is given: 250 ft. massive gray limestone, marmorized; 20 ft. fossiliferous limestone with *Rhynchonella lacunosa*, *Belemnites*, and other fossils determined to be of Jurassic age; 300 ft. thin-bedded limestone, passing into mixed slate and limestone beneath; 100 ft. sandstone, or tuffs, at base in thin beds, the total thickness being 670 ft. Below this is about 4000 ft. of diabase resting upon granite. According to Mr. Burrows this is a metasomatic deposit of quartz within the limestone where the ore consists of gray quartz, rusty with decomposed iron pyrite and carrying on an average 3 oz. gold and 30 oz. silver per ton throughout its lower portion.

No description of the Chihuahua mines should omit the Batopilas silver deposit in the south-central portion of the Sierra region. This old silver mine has had a long and interesting history. As early as 1632 silver was taken from this camp, the first mine opened being known as La Nevada. This is the camp mentioned by Von Humboldt,‡ who says that masses of pure silver weighing upward of 200 kg. were extracted from it. The rock is described as a diabase, and the ore is supposed to be due to faulting. A large number of prominent producers are omitted from this paper. Space will not permit an attempt to even catalogue the producing mines of the State. An attempt is now being made by Mr. Griggs of Chihuahua, who has charge of the State Mineral Exhibit in that city, to prepare such a catalogue.

It is doubtful if there is any region in the world, with an area of equal extent, that can exceed the State of Chihuahua for its mineral resources. To these should be added the great timber and agricultural possibilities. The cattle ranches are among the important assets of the State. The traveler en route to Miñaca passes the ranch of the late Don Carlos Zuloaga, which is reported to have had 99.000 head of cattle upon it in 1900. It is impossible to estimate the wealth of Chihuahua. This is due in part to the undeveloped condition of the mining industry which, notwithstanding the former immensity of ore production, is yet only in a development stage. The next ten years will show a marvelous increase in gold, silver, zinc, lead, and copper production. The completion of the Kansas City, Mexico & Orient railroad will make possible the economic working of hundreds of deserted mines.

[1] R. H. Burrows, MIN. AND SCI. PRESS, May 25, 1907.

‡ Political Essay on New Spain, 4 Vol., London, 1822.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

W. P. W., Blake, California: No. 1, epidote in quartz.

G. W. R., Alameda county, California: Chromite from serpentine mass.

D. M., Pioche, Nevada: Red clay, colored by iron, looking much like 'gouge' material from vein walls.

S. S. B., San Diego county, California: Gold ore; quartz with limonite containing free gold; traces of sulphides remaining.

E. H. S., Schurz, Nevada: No. 1, basic fine-grained diorite, somewhat schistose; may approach a minette; No. 2, altered and reddened andesite; No. 3, hornblende-andesite; No. 4, altered hornblende-andesite; No. 5, biotite-granite.

S. A. B., Fallon, Nevada: No. 1, andesite, probably brecciated, but larger field relations must determine this point; No. 2, highly altered basic tuff filled with seams of hydrous silicates; No. 3, fine-grained massive andesite somewhat altered; No. 4, indurated tuff, probably andesitic; No. 5, indurated andesitic tuff; No. 6, hornblende-biotite-dacite, decomposed.

ORE-SHOOTS AT BUTTE, MONTANA.

By Reno H. Sales.

*The subject of 'ore-shoots' or 'bonanzas' or whatever we choose to call the localized occurrences of relatively richer bodies in a vein or ore deposit, is one of the most perplexing and one of the least understood of all problems relating to the geology of metalliferous deposits. Their importance in mine sampling and mine valuation, is familiar to all who have had occasion to study closely veins of the ordinary type. The presence of well-defined ore-shoots in the copper veins of the Butte district was not recognized in the earlier history of the camp; and it appears that they were of doubtful existence as late as the year 1897, when the Butte Special Folio was issued by the United States Geological Survey. This may be accounted for in large measure by the fact that most of the earlier mining operations were upon what are known as the older 'East-West,' or 'quartz-pyrite' veins, which are of remarkable width and uniformity in mineralogical character. The more prominent of these have been stoped for hundreds or even thousands of feet continuously along their strike, showing little, if any, disposition to develop shoots. There is, of course, a considerable variation in content of the valuable metals in different parts of the veins, but such may not be properly designated as shoots. Later developments, however, have brought new facts to light, and in at least two vein systems which are known to be younger geologically than the Anaconda or East-West system, the occurrence of ore in large irregular bodies, is a characteristic feature. These later veins have been termed fault-veins, because they are known to cut and displace the earlier veins, and because of their physical character. They consist mainly of crushed country which may be either granite, aplite, or quartz-porphyry, carrying small amounts of quartz and iron pyrite either as finely disseminated material, or in the form of small stringers or scarf-like masses irregularly scattered through the crushed country. The fault, or crushed zone, is usually narrow, varying in width from five to twenty feet, exhibiting one or more well-defined planes of movement marked by a dark blue or black tough clay one-quarter inch to five or six inches thick. The above description applies to the barren stretches of vein between the ore-shoots.

Some of these fault-veins have been opened up on the strike for more than a mile, and at intervals immense ore-shoots have been uncovered. These ore-shoots, which are quite irregular in form, show great variations in size, from mere bunches or pockets, up to great orebodies over 1000 ft. long, and of unknown height, in some instances 1500 to 2000 ft. vertical height having been developed with no bottom yet known. The thickness of the ore varies from nothing up to 20 ft., or the entire width of the fault-zone. In the latter case, there may be shown a complete replacement of the crushed country by ore minerals, leaving little evidence of the faulted character of the original space.

The mineralogical content of these shoots is chiefly quartz and iron pyrite, with smaller amounts of zinc blende and copper minerals, namely, chalcocite, enargite, bornite, covellite, and chalcopyrite, the last named being here of rare occurrence. There seems to be no method of reasoning to foretell the position or extent of these shoots. They usually fade out on the strike within a distance of 50 ft. or less; although the limiting boundaries are not always well marked. There appears to be no regularity to the pitch of the shoots, that is, there is no common direction of pitch. There are many examples of what might be termed 'shoots within a shoot,' or localized areas of rich ore within the main orebody as above outlined. There are also enrichments within the larger shoot due to mineralization along cross-faults which are only local and do not extend beyond the boundaries or walls of the main fault. I have observed many examples of this character, indicating continued movement, or readjustment of the orebody, within the fault-zone during the period of vein-forming action. Such internal transverse fissures may be filled by richer ore, or there may be an enrichment of the earlier formed ore adjacent to the fractures, or both conditions may be present. Longitudinal fissuring has occurred during the period of mineralization, and has had an important influence upon the nature of the orebody, but these effects are not readily determinable, as the age of such fissuring is not generally evident.

The conditions under which these ore-shoots were formed are somewhat obscure, and no attempt will be made at this time to enter into a discussion as to their genesis with reference to their mineral content, that is, whether the ores, either wholly or in part, were deposited from ascending or descending solutions, traversing the fault-fissure. A few observations regarding the extent to which the large fault-fissures in the Butte district have acted as channels or passage-ways for underground mineral-bearing solutions, may be of interest. In the first place, it is evident from the thoroughly altered condition of the crushed granite at all points along these faults, that there must have been, at an early period, a reasonably free circulation of waters throughout the entire extent of the fault-zone, producing this intense alteration. But, as these fault-zones are explored by mine-workings, long distances along the strike are found to be absolutely dry and barren of ore, while the ore-shoots themselves are usually wet. These facts indicate that the present positions of the shoots represent the channels or zones through which the ore-bearing solutions traveled. The concentration of all the solutions traversing the fault into these channels, I believe to have been brought about through the development, by continuous earth movements within the fault-planes, of impervious barriers composed of altered, clayey, crushed granite and attrition-clay or gouge. The presence of this impervious material directed the circulating waters along the lines of least resistance. In other words, solutions which at first traversed the entire extent of the fault-fissure, were corralled, so to speak, and confined to

*Abstracted from *Economic Geology*. Vol. III, No 4, June-July 1908.

more definite zones, while the walled-off or excluded portions gradually became dry. The location of the ore-shoots was therefore determined, in part at least, by the physical nature of the country composing the fault-zone. The size and richness of the orebodies may have been influenced to some degree by the cutting off, or damming back, of the mineral solutions, through the later development of impervious material along or within the fault-zone. I have seen many examples of this phenomenon in various parts of the Butte district where the clay and crushed granite of a fault acted exactly as a dam, holding back enormous quantities of water. On the 1000-ft. level of the Six O'clock shaft a cross-cut was driven for several hundred feet, directly under the foot-wall of a large fault zone, in an absolutely dry unaltered granite. After passing through the thick clay and crushed granite foot-wall, a perfect reservoir of water was encountered, the whole mass of fractured rocks for a hundred feet or more being thoroughly saturated. A condition exactly similar was noted on the 1100-ft. level of the Butte & London mine. Alternate wet and dry areas along faults in Butte are characteristic. The wet zones often encountered when drifts intersect faults are usually due to the presence of shattered granite or vein near the fault, and not necessarily from the water traversing the fault-fissure itself.

That the immense quartz-pyrite veins of the old East-West system of copper-veins in Butte were formed along shear-zones having but slight displacement, I have no doubt. Repeated observations show that these earlier fissures intersect the quartz-porphyry dikes, and hence are later. The wonderful continuity and uniformity in size and character of these veins are due to the significant fact that they were not formed along fissures of extensive movement, such as I have described above, but were fracture-zones along which there was insufficient movement to develop the impervious fault-material so characteristic of larger faults. A free general circulation was thus permitted throughout the entire extent of the fracture-zones, finally producing extensive quartz-pyrite veins, of which the Anaconda and Syndicate lodes are the best examples. Later cross-faulting has cut and displaced the fault-veins above described, also the veins of the Anaconda or East-West system, resulting often in an enrichment of the fractured veins adjacent to the intersecting fissures.

The circulation of underground waters through fault fissures of the character above described does not appear to have been in this district as free and extensive as is generally supposed. During the period of faulting, there was more or less fracturing of the older veins, together with strike-faulting along them. The passages for the circulation of mineralizing solutions thus afforded in and along these older veins, were far more important and contain more ore than the main fault-fissures themselves.

Bearings of belt conveyors should not be lubricated with oil, because it will almost surely leak out and coat the face of the pulleys and thus cause slipping. A heavy grease or graphite should be employed.

STEAM SCRAPER FOR PLACER MINING.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. TURNER.

S. J. Norris, of Oroville, California, has introduced a new method of handling gravel. This is a steel-scraper with a total capacity of about six cubic yards which fills itself as it is drawn forward over the placer deposit, and is then hauled by wire-cable up to the sluice-way and dumped into the sluices or other gold-saving device. The power is furnished by a donkey-engine of 130 effective horse-power, wood being used for fuel. In the case illustrated by the accompanying cut the scraper is operating on Coquette creek in Plumas county, California, on creek gravels. The donkey-engine is placed on the slope

Steam Scraper for Placer Mining.

about 70 ft. vertically above the gravel, and the sluice-way is placed perhaps 30 ft. below the engine. The scraper operates fairly well, but it is evident that it would handle more gravel if working on placer-material lying on gentle slopes or in sloping basins in ravines. In this case the best location for the engine would presumably be at the bottom of the slope, the sluice-way being above the engine. The pull of the loaded scraper would then be down-grade to the sluice-way. There are slope and basin-deposits in places in the Sierras where the gold-bearing material often consists of soil and detritus enriched by local stringers and, with a minor amount of water-worn gravel, lies above the ditches, and hence cannot be sluiced in place. There would thus seem to be a field for the use of such a steam scraper, which is not filled by any other device.

Carmen island, in the Gulf of California, 100 miles south of Guaymas, Mexico, and 17 miles long by 5½ miles wide is an almost solid deposit of salt. At present 1200 tons of salt per month are being taken out on not more than 200 acres in area. It costs about 50c. per ton to mine and deliver to a vessel. The product is marketed along the west shore ports. It is not refined.

In a gas explosion at the Rikovskey mine, near Yusovo, European Russia, July 2, 300 men are reported dead; 214 bodies have already been recovered. A fire has broken out and is working toward the inner galleries, where it is said that 150 men are still alive but imprisoned, and in spite of their audible cries for help, cannot be reached by rescuers.

WORKING COSTS IN MINES, AS PRACTISED ON THE RAND.

By John A. Dennison.

*Mining is essentially a commercial business, and therefore should be conducted on lines which approximate as closely as possible to the recognized forms of established businesses.

Accounts are kept for four principal reasons. First, for the convenience of the manager of the mine, who naturally has to follow the cost of each department closely; second, to enable consulting engineers and controlling firms to see the cost of each branch of work, both on the surface and underground, with a view to cheapening or improving such work; third, to supply Government with statistics; fourth, to enable the mine-owner or shareholder to see how his business is progressing, the amount of profit made, or the dividend he is likely to receive.

All initial expenditure on machinery and plant, buildings, dams, shafts, development, head-gear, and the like, up to the time of crushing is, of course, capital expenditure. Any surplus working-capital that there might be would soon be spent in completing the plant, and in improvements. The trouble arises after the plant starts producing, when all the working capital is exhausted, how to deal with the further expenditure on similar items which goes on more or less during all the life of the mine, that is, whether to charge it to capital-account or to working-costs. If the items are large (duplication of mill, new vertical shaft, new cyanide or slime plant), and the necessary money is raised by a new issue of shares, debentures, or special loan, such expenditure is generally considered capital expenditure. But if the items are smaller ones occurring and recurring during the life of the mine, and are paid out of the profits, the mine-owner or share-holder will, so far as he is concerned, consider them working costs. The ideal method, and perhaps the simplest, is to close the capital-account when the plant is complete and running and the original working capital is exhausted; and not to re-open it except for special expenditure of money specially raised.

Working-costs naturally vary in different countries, on different fields, and also on the same fields; in the latter case, owing to relative size of plant, hardness of rock, and dip and thickness of vein. But many managers are more or less driven by the directors or the public to show low working-costs, as it is unfortunately often considered that low working-costs mean good management, whereas they may often mean poor policy, and slightly higher costs might result in additional net profit.

Looking at a mine again as a commercial business, it seems necessary or advisable that working-costs should in some way reflect the amount of capital expended, either through depreciation or interest and redemption of loans. The prevalent practice, however, seems to be not to include depreciation in working-costs, even when it is allowed for, but to write it off as 'premium on shares' account, or some other equally useful account, so that it does not directly show in the costs. The consequence of the usual practice of making no allowance for depreciation or redemption of capital in mine-costs is that it is often impossible to see how much real profit is being made; in fact, in cases where working-capital shares have been issued at a premium the profits or dividends often seem large on the nominal capital, but would be much smaller on the total amount of money raised for working capital, and still smaller if on the total amount spent, including capital expenditure out of profits, which in time may amount to large sums. Sometimes, indeed, if the whole expenditure were considered, the profit shown would not be sufficient to redeem the capital, much less pay interest on it. Curiously enough, money spent on capital-account is often not looked upon as additional working-capital raised. Interest on and redemption of such money must be allowed for before the additional plant can be correctly said to have produced any additional profit.

Capital expenditure on the Rand may be divided into two groups: (1) initial expenditure to bring a mine to the producing stage; (2) subsequent expenditure. The initial expenditure may be divided into four headings: (a) Property account: no depreciation is allowed for this in the balance sheets or working-costs, and it stands at its original cost entirely through the limited life of the mine, though the exhaustion of ore makes it less and less valuable. (b) Machinery and plant, buildings, and dams: in some cases depreciation is written off every year to premium on shares account, or appropriation account, in other cases not at all, it being considered that as the money has been spent in bringing the mine to the producing stage, depreciation of the account would mean the creation of a cash reserve and payment of smaller dividends, if it had to be debited to profit and loss account. (c) Shafts: all initial expenditure on vertical and inclined shafts is left as an asset in the balance sheet, that is, neither depreciated nor redeemed. (d) Development: in the largest group of mines inital expenditure on development, that is, sufficient to bring the mine to the producing stage, is not written off, depreciated, or redeemed at all, it being decided to keep ore reserves to this or a higher level by current development, which is charged direct to working costs.

Regarding subsequent capital expenditure, that is, after the milling stage is reached, there are many methods employed, and each mine-management has its own ideas as to what constitutes capital expenditure. Any new expensive machinery, increase of plant or buildings, or new shaft, is charged to capital account, all repairs and renewals being charged to working-costs. Sometimes a manager is given a stipulated allowance for renewals of machinery and plant, and he has to make this sum do. Some mines on the Rand have at times closed the capital accounts altogether, all further expenditure being charged to working-costs; but most of them have at later dates re-opened the capital account for various reasons. The chief trouble is in regard to inclined-shaft sink-

*) act of a paper read before the Institution of Mining & Metallondon.

ing, cutting stations, driving, winzing, raising, cross-cutting, box-holing, and so forth. In one large group of mines all such expenditure is called development and is charged to working-costs monthly, care being taken to spend as far as possible an equal sum every month sufficient to keep the ore-reserves up to a fixed standard (2 to 3 years ahead of the plant), and generally to increase the total tonnage gradually. This system deserves consideration, as it is the simplest, and gives the shareholder the clearest idea of the position. Another favorite system on the Rand is to consider all current sinking of inclined shafts, cutting stations, and sometimes main cross-cuts, as capital expenditure, and not as development. In such cases only the costs of driving, winzing, raising, and box-holing are considered to be development, and these are debited to a separate capital account, which is practically a suspense account.

As regards additions and renewals to machinery and plant, beyond ordinary maintenance, after the initial plant is completed, the system adopted should depend upon whether the money is provided out of profits or raised separately. If raised by means of an issue of shares, it would doubtless be considered capital expenditure, and in some cases depreciation would be charged somewhere in the balance sheet or appropriation account, but, according to present practice, would not show in working costs. If the money is raised by an issue of debentures or a loan, under the present system the interest is sometimes charged to working costs, but generally to an appropriation account, and the redemption of the debentures or loan is not shown in working costs. The result of this system is that capital expenditure goes on year after year, especially in directions that will show any decrease in working-costs; the decrease generally follows, but as the costs contain no portion of the extra expenditure it is almost impossible to tell whether the saving in costs has been sufficient for the interest and redemption of the additional expenditure. Personally, I think the system of a monthly allowance in working-costs for additions to plant and machinery is in most cases the best, provided this allowance is used as a fund which is only overdrawn in exceptional cases. If by this means the plant is maintained at full value there would not appear to be the same necessity for depreciation.

Depreciation on original machinery, plant, buildings, and equipment is a vexed question. Generally speaking, companies whose head offices are in London are compelled by their auditors to write something off annually for this, but it is rarely shown in working-costs. Companies with head offices in the Transvaal and elsewhere do more as they like, and frequently no depreciation is written off.

Stores on Hand: This item in the balance sheet should include only such stores and duplicates as are suitable for current requirements. All accumulations of discarded appliances or deteriorated stores should be written off every few months, the loss being charged to working-costs in average monthly installments.

Suspense Accounts: A few mines manage to do without these accounts (which are never disclosed in the monthly or quarterly reports issued to shareholders, and are very rarely disclosed clearly in annual reports), but in general they seem to be regarded as necessary evils, and at times they are almost unavoidable. Annual payments for fire insurance and licenses, as well as recruiting fees for native labor, and the like, are charged to suspense accounts, and working-costs debited monthly with a proportion.

Gold Reserves: Most of the Transvaal mines have kept a certain amount of undeclared gold in reserve during the past few years with a view to showing regular outputs; at times these reserves have amounted to as much as 10,000 or 20,000 oz., not kept at the mine, but realized by the bank in the ordinary way, credited to the general account, and in many cases the money has been spent. The legality of such a course has been questioned, and some mines have now abolished the system; others continue it, but publish the position of the reserve at the same time as the monthly or quarterly profit; and a few retain the original system of undeclared gold-reserves.

Head-office charges are sometimes included in working costs where the head-office is near the mine, say in Johannesburg; in other cases they are not so included. This is a frequent cause of difference in working-costs. Sometimes the expenses of management, salaries of manager and consulting engineer are included in general charges under working-costs; sometimes they are given separately.

Realization of Gold: On the Rand this item of cost is frequently debited to gold account, the net yield only being shown in monthly and annual reports, thus showing the lowest possible working-costs. In many other cases it is charged as a separate item or under general charges to working-costs; and in one case it is deducted from the yield in monthly reports and included in working-costs in the annual report.

Causes of accidents in the mines of the Rand for the year ending June 30, 1907, are distributed as follows, according to a report of the Government mining engineer, published in *The South African Mining Journal.*

Owing to danger inherent to work itself	55.07 %
Through fault of fellow-workmen	8.97 %
Through carelessness or ignorance of injured persons	33.94 %
Owing to defective plant or material	2.02 %

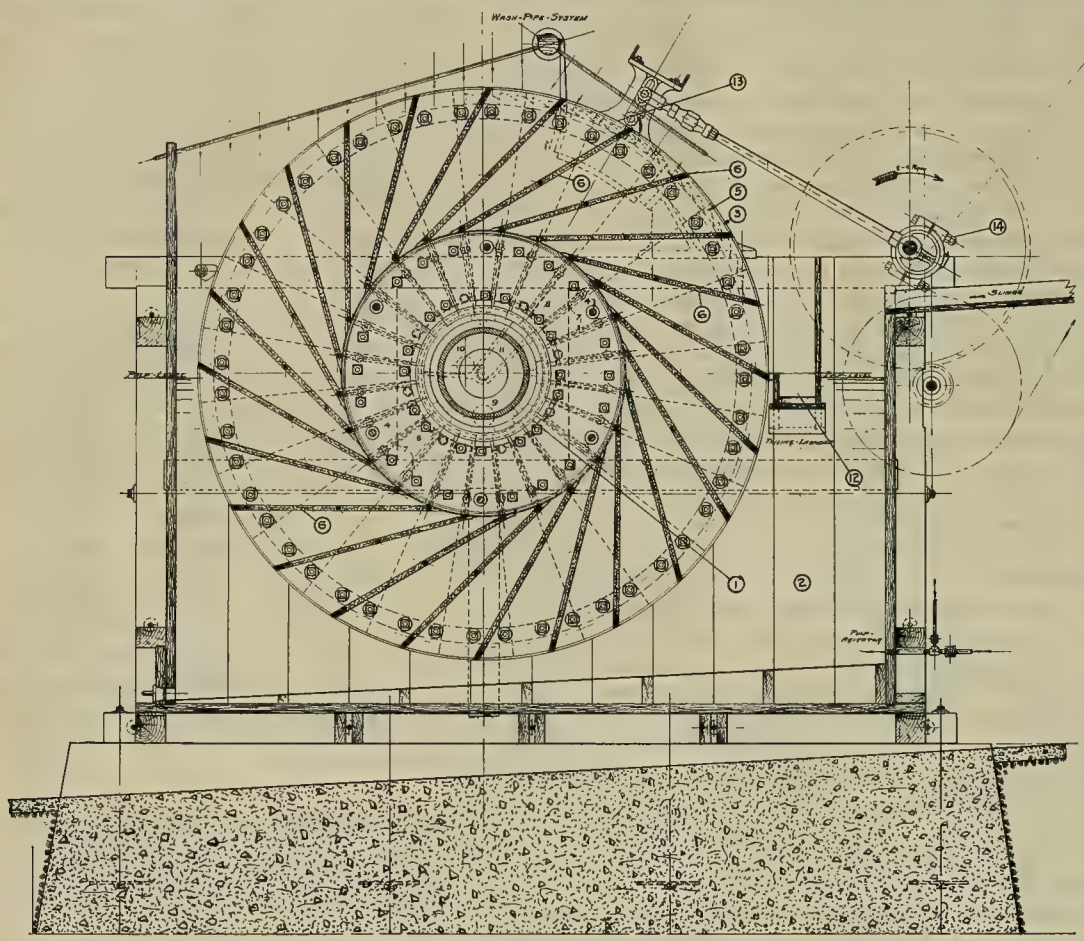
In other words, practically 43% of the casualties which occurred are directly attributable to either the carelessness or ignorance of the persons employed underground, while a very small proportion of the accidents are in consequence of defective plant or material. The majority of the former class of accidents are due to the colored laborers, which fact is a strong argument in favor of their more efficient training. Our Transvaal contemporary suggests that this would be accomplished if the natives were engaged on longer contracts, perhaps three years, instead of on the very short terms, 4 to 12 months, as is the custom at present.

CONTINUOUS SLIME FILTER.

Written for the MINING AND SCIENTIFIC PRESS
By ROBERT SCHORR.

Your journal has given the subject of filter-pressing slime more thorough and strictly professional attention than any other publication. It is obvious that most of the space has been devoted to discussion, and to illustrations of those vacuum and pressure-filters which have proved successful in actual practice. Among the several untried designs which have found due consideration, is also Bertram Hunt's continuous slime-filtering machine. The stationary type of this appliance has been clearly outlined in Lochiel M. King's able article, 'Cyanidation in Nevada,' of January 25, 1908. This machine is of special interest, as it is apparently the only slime-filter which employs sand as a filtering-medium. For that reason expressions of opinion and data would be greatly appreciated from Mr. Hunt and from all those who have made tests with sand as a filter-bed for slime, and for mixed slime and sand. I do not venture an opinion myself, as I have had no experience in the operation of slime-filters. They have, however, interested me greatly, and about 18 months ago I designed a continuously-acting filter-wheel, patents for which were granted recently.

The main object of this design was to create a filtering and washing apparatus which would be entirely automatic in its operation. Slime transfers are entirely eliminated, and consequently the time of treatment is reduced materially. In looking over the accompanying drawings it will be realized that a large filter-area can be accommodated upon a limited floor-space. No storage vats, and but little attention and power, are required. Two cast-iron pump-chambers (1) anchored to the sides of a wooden box (2) are the supports and trunions on which the filter wheel revolves. The wheel itself consists of three circular discs (3), thoroughly tied together by steel rods (4). These discs have grooves formed by cleats (5) for the support of filter frames (6) in a position tangential to a circle of a diameter smaller than the wheels. The filter frame can be made either of standard pipe, of cast-iron or wood with filter-cloth, preferably canvas sewed around the same. The space between the two sheets can be filled in with matting or other porous material. Both sides of each filter leaf form effective filtering surfaces. Each frame is connected by means of pipes (7) to an iron ring (8) revolving with the wheel upon the pump chamber. Local openings in these bring the filter-frames, in the course of one revolution, into communication with the various pumps or other devices for the production of a vacuum for the purpose of withdrawing solution and wash-water, and



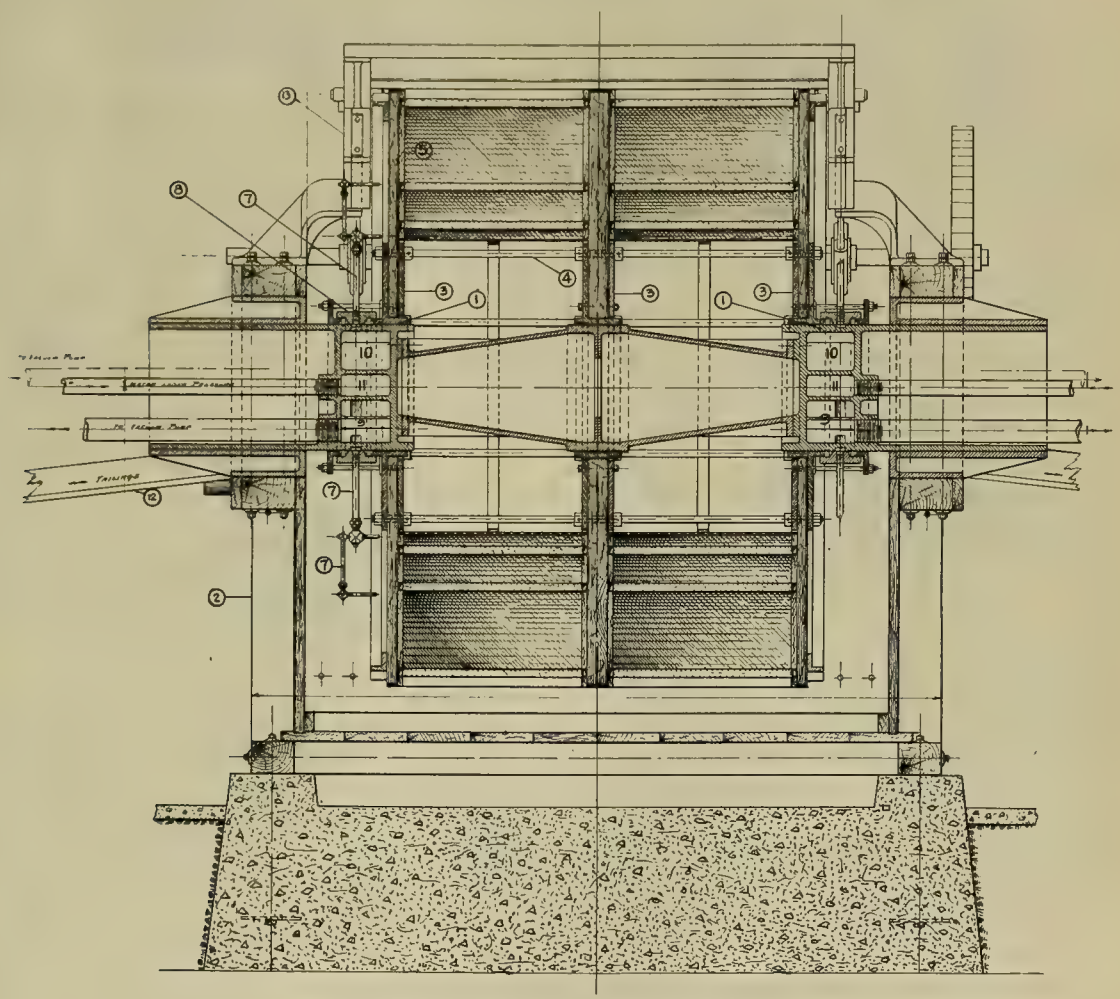
Schorr's Continuous Slime-Filter. Transverse Section.

for forcing off the filtered cakes of tailing by means of water or compressed air.

Corresponding with these three functions, namely, with the formation of cakes by sucking off solution, with the washing of the cakes and withdrawal of the wash-water, and with the discharging of the washed cakes by forcing them off, there are three subdivisions in each pump-chamber. These three spaces, 9, 10, and 11, are connected individually to the necessary apparatus. The tailing falls into a launder (12), and is carried away either mechanically or with water. Various means may be used to revolve the filter-wheel. That shown in the transverse section is probably the most simple, consisting of an ordinary adjustable ratchet (13) operated from an eccentric (14). The gearing and pulley indicated are necessary in view of the slow speed required.

In operation the slime enters the box below the driving-shaft and the level is kept as high as the tailing launder. During the slow travel of the filter-leaves through the pulp the cakes are formed, all solid matter being drawn by the vacuum to the filter cloth. By changing the speed of the wheel the thickness of the cakes can be regulated. During this period each filter is in connection with chamber 9, and the strong solution is obtained separately. The filter planes emerging from the box are subjected to a long water-wash, and the liquor is drawn off through chamber 10 by another pump. From the point where the filter-planes begin to slant toward the tailing-launder they communicate with the central space (11) of the chamber, which is connected to water under pressure or to a compressed-air main. In this manner the cakes are forced off into the tailing-launder for further disposition. Ample time is given for discharging, after which the operation is repeated.

The arrangement, as outlined, may be modified in different ways to suit the material under treatment. The filter-wheel can be housed in a steel shell, with an opening at the highest point for feeding the pulp to the machine. After applying a vacuum or pressure for some time, a door, placed at the lowest point of the steel housing, is opened to discharge the filtered material. Another variation of the design is effected by introducing the material to be filtered through the central shaft of the wheel.



Schoor's Continuous Slime-Filter. Longitudinal Section.

Registration of mining companies in Great Britain, during the 25 years ending with 1904, was at the average rate of one company per day, with an average nominal capital of more than £100,000 each.

MINE REPORTS.

LA ROSE MINES, LTD., COBALT, ONTARIO.

The La Rose mines comprise a group of claims in Coleman township, Ontario, aggregating 223½ acres. In addition the Company owns 90% of the University J. B. claims of 56 acres. The La Rose mines began operations in July 1904, since which time, up to June 1, 1908, the gross ore-sales have amounted to $1,541,519, and the costs have been:

Mining and developing	$285,442
Marketing ores	98,132
All other expenses	151,904
Total	$535,478

Thus the Company has earned a net profit of $1,006,041, which has been distributed among the stockholders. The total tonnage of ore on which this profit was realized was 5583, yielding 2,675,161 oz. silver. On the 'J. S.,' claim fourteen veins have been found, of which only three have been developed. The main vein has been explored underground to a depth of 240 ft., and for a length of 900 ft. on the strike, and very little stoping has been done, as the ore-production to date would indicate. In connection with a geological report on this property, Willet G. Miller, Provincial Geologist of Ontario, presents the general geology of the district, including the La Rose mines, in the following succinct description:

The geology of the Cobalt area has been described by me in reports published by the Bureau of Mines of the Province of Ontario. There are three series of rocks in the area which have a bearing on the ore deposits. The rocks are all of pre-Cambrian age. To the eldest series is given the name Keewatin. It is an igneous complex, and consists for the most part of greenstones and other basic rocks with which are associated in minor quantities acidic types such as granite-porphyry and related rocks. These Keewatin rocks formed at one time the surface of the earth in this part of the continent, and were worn into hills and valleys much like those of the present surface. After the erosion of the surface of the Keewatin there was a subsidence of the land surface, and the Keewatin became covered with fragmental material which was laid down chiefly through the agency of water. This fragmental material consisted of gravel and boulders, impure sand, and so forth. The gravel, boulders, and sandstones filled in the valleys and other depressions of the Keewatin surface and ultimately, probably, covered the ancient hilltops. Through the action of various agencies the fragmental material became consolidated and is now represented by what is known as the Huronian conglomerate, gray-wacke slate, and so forth. It will be seen from what has been said that both Keewatin and Huronian are 'age-names.' It will also be clear that the Huronian fragmental material (conglomerate mainly) has a greater thickness at some points than at others. Where old valleys have been filled by it the thickness may be several hundred feet, while surrounding old hilltops the thickness is much less. The third series of rocks in the area which is of economic value, is what is known as the diabase. This represents basic material which intruded both the Keewatin and the Huronian series after the close of the Lower Huronian period. For the most part, the diabase spread out between the Huronian and Keewatin in the form of great sheets of laccolithic masses. Since the eruption of the diabase, the area has been subjected to great denudation. The surface has been cut into hills and valleys and the geological map shows a patchwork of Keewatin, Huronian, and diabase, together with glacial and recent deposits.

Having briefly described the rocks of the area, the origin and nature of the orebodies may be dealt with, details of which will be found in the Government reports referred to. Immediately preceding the eruption of the diabase, the rocks of the area were subjected to a great disturbance, giving rise to openings through which the molten diabasic material made its way upward. After this great disturbance, and as the great intruded sheets and masses of the diabase gradually cooled, and the surrounding rocks settled down through the contraction of the diabase, numerous cracks and fissures were formed, not only in the Keewatin and Huronian, but also in the diabase itself. It is these cracks and fissures which are now occupied by the ore-bodies. In all parts of the world we have evidence that heated impure waters circulate through the crust after the eruption of material such as that of the diabase, to which reference is made. In the Cobalt area, such heated impure waters, under great pressure and heavily charged with mineral matter, worked their way from subterranean depths through cracks and fissures toward the surface. These waters happened to be charged with cobalt, nickel, arsenic, silver, and other materials which, as the waters approached the surface, and had their temperature and pressure lowered, were gradually deposited, and gave rise to the minerals now found in the veins of the Cobalt area. The first minerals to be deposited were the cobalt-nickel arsenides (smaltite, niccolite, and so forth), together with other compounds. The silver minerals appear to have been deposited at a somewhat later period, after there had been another comparatively slight disturbance in the district.

ST. JOHN DEL REY MINING CO., LTD.

Morro Velho, Minas Geraes, Brazil.

The net profit obtained by the St. John Del Rey Mining Co. for the year was £70,840, as compared with an average of £58,747 in the six preceding years. The output for the year under review—156,459 tons—was just 250 tons more than the average of the six preceding years. The ore treated during the past year was 151,454 tons and the assay value was 46s. 6d. During the six years from 1901 onward the average recovery has been 82%, but last year's figure was 91%, which made a great difference in the profit, as the recovery has been 42s. 4d. per ton, as against the previous six years' average of 38s. 2d. The increase in the profit was due to a number of causes connected with the reduction department. One was the introduction of tube-mills, which had enabled them to stamp more ore, and this had enabled the cyanide process to deal with a very large percentage for a pyritic ore, which contained 40 to 50% of its gold in pyrite. Exchange in the past year has been a trifle over 1s. 3d. per milreis, against 1s. 1d. for the previous six years.

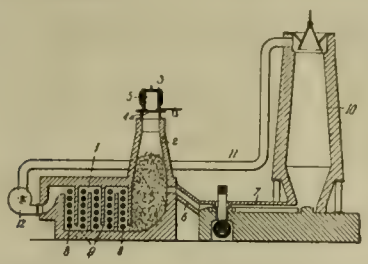
The cost for the past year was 32s. 10d. per ton, against the average for the preceding six years of 33s. 2d., but the increased cost of the milreis must be borne in mind. As to reserves, Superintendent Chalmers reports 1,000,000 tons—900,000 below horizon 11 and 100,000 tons above. In the reserve mentioned was included horizon 15. In horizon 15 a level had been driven 60 ft. above the true level, and communication made between the two winzes that ventilated the horizon, and for some distance beyond winze 18. Altogether the level had been driven 450 ft., and an average of 10 ft. of good ore was found.

For many years the Cuyabá mine had not met the outlay upon it, and it had fallen about £4000 behind. This year it had some hundreds of pounds sterling to the good, but that was neutralized by expenditure which was absolutely essential to continue working there. An expenditure of £5000 has been authorized for putting the mill, nearly 30 years old, into good order, and to improve the reduction plant. There seemed a fair probability of being able to extract economically something like 85% of the gold contained in the ore from the Vianna and Main lodes, as against less than 50% in the past. In the Vianna lode, as distinct from the old Cuyabá, the indications were most encouraging. The breadth of vein is fair, and the richness of the ore at times simply astounding, but it is believed that the average of the whole might be safely taken at 5 oitavas (1 oitava=⅛ oz.). Iron lands belonging to the company cover an area of about 15,000 acres. The ore is of excellent quality, yielding 60% iron almost free from phosphorus. In addition, the company has about 20,000,000 tons of rubble iron ore which contains, as far as known, 0.26% of phosphorus. The directors will transfer £5000 or £10,000 of the reserve fund to meet the extra capital expenditure authorized for equipment to smelt the iron ore.

MINING AND METALLURGICAL PATENTS.

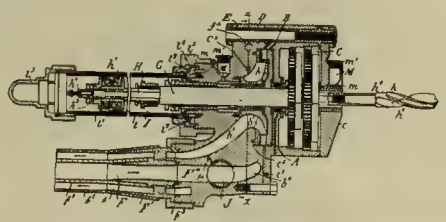
Specially reported for the MINING AND SCIENTIFIC PRESS.

SMELTING-FURNACE.—No. 891,248. Eugen A. A. Grönwall, Ludvika, Sweden.



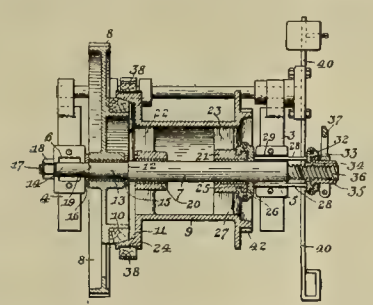
In an apparatus of the character described, the combination of a smelting furnace, a closed chamber containing particles of carbon, a second chamber containing electric heating elements and capable of being heated to a temperature of 1000° C. by an electric current, a passage connecting the heating chamber with the lower end of the said chamber containing charcoal, a passage leading from the charcoal chamber above the bottom into the smelting furnace, a passage leading from the upper portion of the smelting furnace into the other end of the heating chamber, and a pressure device in the latter passage for forcing some of the gases from the smelting furnace into the heating chamber.

TURBINE-DRIVEN ROCK-DRILL.—No. 888,506. Moses Kellow, Penrhyndendraeth, England.



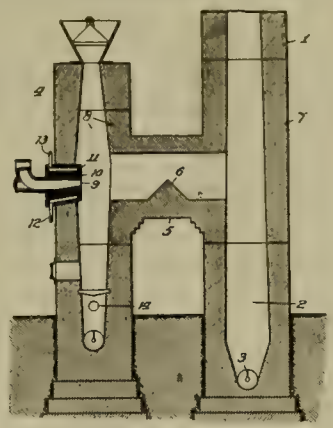
In a turbine-driven rock-drill, the herein described means for discharging the exhaust water at a higher level or otherwise against an adverse pressure; same comprising a turbine-wheel of the kind herein referred to and having its vanes arranged to permit of a large angle of outflow; a casing having a chamber for said turbine, and a discharge passage which gradually increases in area towards the outlet and which receives the water on leaving the vanes of said turbine, substantially as set forth.

HOIST.—No. 892,907. Frank P. Snow, Los Angeles, California.



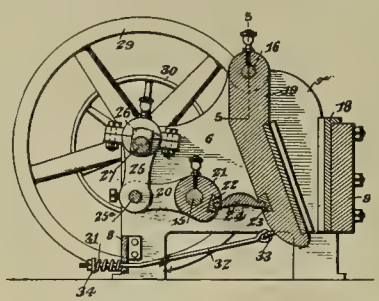
A hoist mechanism comprising a frame having an abutment bearing and a gripping bearing, provided with shaft gripping projections, a shaft mounted in said bearings, a gear, and a drum loosely mounted on said shaft and means for reciprocating said drum on the shaft, extending between the gripping projections of the gripping bearing to a point outside the frame.

ORE-REDUCING FURNACE.—No. 890,229. John T. Jones, Iron Mountain, Michigan.



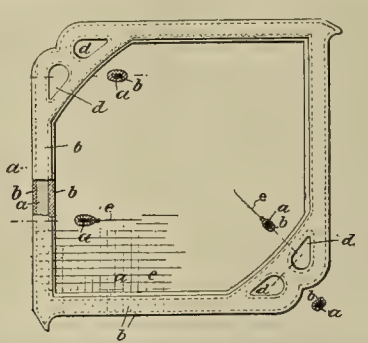
An ore-furnace comprising an ore-stack, a carbonaceous-fuel-burning furnace, and a flue composed of solid carbonaceous material connecting the fuel-chamber with said stack, for the purpose set forth.

ROCK AND ORE CRUSHER.—No. 892,861. William H. Lloyd, Los Angeles, California.



In a crusher of the character described, the combination with side walls having outstanding projections and inset ribs, of an end wall located against the ends of the side walls and projecting beyond their outer faces, said end wall having a thickened portion fitted between the side walls, a stationary jaw located upon the thickened portion, side plates interposed between the ribs of the side walls and the stationary jaw, holding bolts passing through the projecting ends of the end walls and the outstanding projections of the side walls, tie rods bridging the space between the side walls, certain of said rods having their ends located in and secured to the outstanding projections, a movable jaw, and actuating means therefor including a device journaled on one of the tie rods.

FILTER ELEMENT.—No. 887,349. Carl Sellenscheidt, Berlin, Germany.

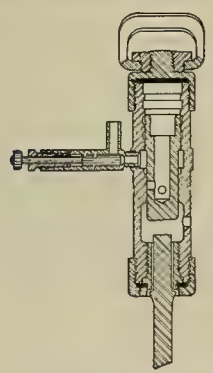


A filter element comprising a frame and a grid therefor adapted to withstand the lateral pressure of the filtering material and formed of a rectilinear lattice or network of metallic wires under longitudinal tension.

The Carnahan System of Breaking Rock.

In hard rock one man can easily drill 45 ft. per shift with a No. 1 Murphy drill; 65 ft. with a No. 2, and 90 ft. with a No. 3, and he can put his holes in to take advantage of the ground the same as if he were doing the work by hand. The extreme simplicity and durability of the Murphy drill depends largely on the fact that there is but one moving part, and when one of these drills goes underground, it goes there to stay. The miner does not lose time bringing it to the top for repairs. It is well established that rock can be broken more economically by means of shallow holes, put in so as to take advantage of the ground, and shot often, than by filling a heading with deep holes. The reason why a heading is filled with deep holes, where larger mounted machines are used, is because it takes so much time to set the machine up and take it down, and it is not practical to do this more than once or twice per shift. With a machine that takes no time to set up or take down and permits the holes to be put in just as they would by hand, a great saving is effected in power and in the number of feet of holes necessary to be drilled. In order to get the best result out of hand machines, the hole should not be put in more than 48 in. They should be pointed to take advantage of the ground, and should be shot twice per shift, or oftener, or, if this is impossible, the drill must have plenty of space to work in. A small streak of ore can be kept just as clean when Murphy machines are used, as if broken by hand. All miners will admit that in ordinary ground, rock can be broken cheaper by hand than with a mounted drill if the question of time is eliminated. If this be admitted, the proposition becomes simple, for with a Murphy drill a man can drill with ease four times as much as he can by hand and use no more powder per ton of rock broken. The wear and tear of the machine is very slight. On an average they will not cost more than $3 per month to keep in repair, and they take about one-third as much air as the 2½-in. so-called one-man 'baby' machines.

From the description and illustration it will be seen that the Murphy air-hammer drills are adapted to all kinds of



practical mining, such as sinking, stoping, tunneling, and block-holding, and they are adapted to be used with solid or hollow steel, wet or dry. One line of repair parts will suffice for all machines, as the repair parts for a Murphy drill are made strictly interchangeable. To reach the cylinder, the oil in the reservoir must pass through a leather gasket, which is made of heavy sole leather, unperforated, through which the oil must soak. This it does just fast enough to keep the cylinder properly lubricated. This advice is more important than may appear at first sight, for miners are notoriously careless about oiling their drills. Examination of the illustration will show the simplicity of the machine, there being but one moving part. Every part can be readily removed and replaced if worn. Any one can understand it, and any one can run it. These drills are manufactured by C. T. Carnahan, at Denver, Colorado.

The Municipal Journal and Engineer has moved to 239 West 39th street, New York.

Commercial Paragraphs.

Woods & Huddart have removed to 356 Market street, San Francisco.

Bainbridge, Seymour & Co., mining and consulting engineers, have moved to 352 Salisbury House, London.

The Central Machinery Co. announces that its head office has been moved to 18th and Blake streets, Denver, Colorado.

Hendryx Cyanide Machinery Co., Denver, Colorado, reports the sale of a complete cyanide plant to the Dixie Royal Mining Co., Dixie, Idaho.

The Deister Concentrator Co., of Fort Wayne, Indiana, has recently sold four of its No. 3 tables to the Florence-Goldfield Mining Co., Goldfield, Nevada.

The Eclipse Drill Sharpener & Mfg. Co., of Denver, Colorado, has recently sold a New Eclipse drill sharpener to the Elkton Con. Mining Co., at Victor, Colorado.

The James Ore Concentrating Co., of Newark, New Jersey, has shipped 12 James slimers and 8 James concentrating tables to the Hinds Con. Mining Co., at Santa Barbara, Mexico.

The Dearborn Drug & Chemical Wks. announces that, at a recent directors meeting held at Chicago, W. A. Converse was elected secretary and chemical director and Ralph R. Browning was elected treasurer.

The Western Gas Engine Co., of Los Angeles, reports that its last year's business amounted to $250,000 and that installations were made over the entire Pacific Coast from Alaska to Mexico. It is making a specialty of a 300-hp. fluid-fuel engine.

The E. I. du Pont de Nemours Powder Co. has recently placed on the market a dynamite having a low freezing point. It is claimed by the manufacturers, that by the use of ingredients which in no way detract from the strength of the explosive, the freezing point of the nitro-glycerine is lowered to 35° F. Red Cross dynamite, as the new product is called, is made in strengths from 25 to 60% on both the straight and ammonia formulas.

Publications Received.

Clays: Their Commercial and Artistic Products. By W. S. Ward. Proceedings of the Colorado Scientific Society. Vol. IX, pp. 31-46.

Map of Minaret District, Madera county, California. Issued by California State Mining Bureau, San Francisco. Sent to any address for 22 cents.

Mineral Resources of Alaska. Report on Progress of Investigations in 1907. By Alfred H. Brooks and others. Bulletin No. 345 of the U. S. Geological Survey.

Passaic Folio of the Geological Atlas of the United States. Folio No. 157 of the U. S. Geological Survey.

Voids, Settlement and Weight of Crushed Stone. By Ira O. Baker. Bulletin No. 23, University of Illinois Engineering Experiment Station.

Catalogues Received.

The Jeffry Mfg. Co., Columbus, Ohio has issued catalogue No. 31-A, on crushers and pulverizers.

The Redwood Manufacturer's Co., San Francisco, has issued catalogue No. 3, descriptive of cyanide plant equipment.

The Arthur D. Little Laboratory, Boston, has issued a pamphlet which it calls 'Some things a manufacturer should know about coal.'

The Standard Gauge Mfg. Co., Syracuse, New York, has issued Bulletin No. 2, devoted to its standard line of pressure and vacuum gauges.

The Bristol Co., Waterbury, Conn., has recently issued a small catalogue describing and illustrating its line of staggered-point steel belt lacing.

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EDITORIAL.

THE COST of electric transmission lines for power underground does not forcibly impress the lay mind, nor, for that matter, the mind of many an engineer. An electric installation is often decided upon as the result of a 'snap-judgment' rather than after comparison of estimates. Mr. Arthur B. Foote contributes suggestive remarks on the relative costs of electric and compressed-air transmission, which we print on another page of this issue. What Mr. Foote tells us is not new, but it is so frequently overlooked that a warning to calculate instead of guess, when such problems arise, is most pertinent.

CIGARETTE SMOKING has been forbidden among all employees of the Nevada Consolidated Copper Company during hours of duty. The order is based on the simple assertion that "the cigarette habit impairs usefulness." Physiologists who have insisted on the emasculating influence of the pungent mixture of fumes from doctored tobacco and rice paper will be comforted to receive endorsement in the commercial estimate placed upon the effects of this form of self-indulgence by a great corporation which has developed principles of economy and efficiency to the highest point. Some one may now seek contrasts between racial energy and cigarette consumption. At first thought some startling contrasts come to mind.

TAKING STEEL production as a measure of financial conditions, the achievement of the United States Steel Corporation for the quarter ended June 30, gives great encouragement. The net earnings, aggregating $20,265,756, were in excess of those for the previous quarter by the substantial amount of $2,036,000. The earnings in May were known to be small, so that the increase is due chiefly to the output in June, a phenomenon so unusual in the steel trade that some critics have hinted at manipulation to produce a favorable appearance. A corporation which has been steadily earning profits even in times of business depression, and which was able to report an undivided surplus on December 31, 1907, of $122,645,243, could easily 'doctor' the returns for the sake of creating a good impression and stimulating confidence and activity in the world of commerce. But the genuineness of the reported earnings wins the more credence from the fact that the orders booked in July represented about 26,000 tons daily. The demand has not come from the railroads, but is chiefly a direct result of the large harvests, which have created a strong demand for tin-plate, agricultural machinery, and finished steel. There is, however, renewed activity in car-construction, and it is announced that orders will be placed immediately for six thousand steel cars for the Harriman roads.

What Constitutes a Placer Discovery.

IT had become a fixed principle in Alaska that valid location of placer claims necessitated a prior bona fide discovery of gold-bearing gravel, having a tenor such as to warrant development as a mine. Under the conditions prevailing throughout a large portion of the Territory, it followed from this requirement that actual discovery of gold in the gravel on bed-rock had to be made before valid rights could be sustained through the location of a claim. This was a less liberal interpretation of the statute than has prevailed in most of the Western States and Territories, and seems particularly onerous, in view of the short season for work and the severe climatic difficulties against which the miner has to contend in the Far North. Viewed from the standpoint of Californian practice the Alaskan restriction appears exceptionally rigid, although Judge Ross of the United States Circuit Court for the Southern District of California ruled that "indication of the existence of a thing is not the thing itself" (Nevada Sierra Oil Co. *v.* Home Oil Co., 98 Fed. 673, 676). Nevertheless, where the existence of a thing is so strongly indicated that its presence seems certain enough to warrant the expenditure of time and money in exploration, the courts have with great unanimity held the validity of location upon such evidence, feeble though it may be, in lieu of actual discovery of the valuable mineral in its bed or deposit. Moreover, the dispossession of a locator who has performed the necessary acts to give legal occupancy, claiming to have made a discovery of valuable mineral, and having done the required work within the statutory limits of time, is so repugnant to the custom of the courts, that any reasonable proof of good faith will render his possession practically unassailable. The danger from stability of possessory right to a claim already located, even though located for speculative and not strictly legitimate purposes, is far less than the invitation to trickery and fraud which would follow by making it easy for 'jumpers' to attempt to justify re-location on the ground of technical error on the part of earlier claimants. The liberal construction of the statute makes for the higher safety and ultimate prosperity of the community.

The Alaskan case of Cook, Ridenour *et al. v.* David Johnson *et al.*, locally known as the 'Juntilla case', has been decided by Judge Gunnison of the First Judicial District of Alaska in favor of the original locator, who confessedly had found only a few 'colors' of gold in the 'muck' or soil-covering over the gravel. Instead of proceeding to prospect the claim, he cut out the brush for surveying the lines, and constructed a cabin on the property for his own use. Subsequent claimants founded their pretensions upon a more important and conclusive demonstration of the existence of gold in workable quantity in the gravel beneath the 'muck'. The evidence of good faith, taken in connection with the provable sources of gold which, by reasoning from analogous cases in the district, should warrant a man in expecting valuable deposits, and with the work which the claimant had done, was accepted by Judge Gunnison as sufficient to sustain the early locator's right to the property. The ruling is in accordance with the spirit generally prevailing in the Western courts.

Gold-Dredges, Large and Small.

WHILE the tendency toward ponderous construction and huge capacity in gold-dredging appliances goes on unchecked, there seems to be a call for efficiency also at the other end of the scale. In this issue we record the achievement of a superb dredge recently built for the Folsom Development Co. in California, having buckets holding eight and a half cubic feet, and capable of digging one hundred and fifty thousand cubic yards of hard gravel per month from a depth of thirty-five feet. This is a different story from the occasional triumph of sixty thousand yards of easily dredgable gravel which produced boasting only a few years ago. Less than four years have passed since dredge-operators were seriously discussing whether the loss of time was not so much less with three-cubic-foot buckets than with those of five cubic feet that the lighter chain of buckets would in the long run outstrip the larger machine. Faulty details of construction made criticism pertinent at that time. Today it is merely a question of the amount of gravel available and the length of the owner's purse; the machine with big buckets has vindicated itself. In fact, dredges with thirteen-cubic-foot buckets are operating at Folsom, digging one hundred and eighty thousand cubic yards per month, at a total cost of three cents per yard.

The new achievements are clearly set forth by Mr. Frank W. Griffin in this issue, and his statement that progress will henceforth be along the line of perfection of detail is significant. While this is probably true for what we may term 'standard' dredges—for a truer standard type has been more nearly reached in dredges than in stamp-mills, despite their difference in antiquity—there are comparatively few fields suitable for gold-dredging on a scale commensurate with a capital-expenditure of a half to several millions of dollars. There are, however, multitudes of small placers, situated so that hydraulicking, booming, or 'blowing-down' as described elsewhere in these columns by Mr. James Park, are not economically applicable. Many toy designs have been made to fit such cases, and financial failure has almost invariably followed. Mr. H. W. Turner presented in our last issue a note on a steam-scraper adapted to a small placer in the Sierra Nevada. It is interesting chiefly as showing that a need exists for economical gravel-excavators of small cost and moderate capacity, and that meagre attention has been paid to it by engineers of training adequate for reaching successful solutions of the problem. The steam-scraper seems to offer some possibilities. It was applied once before in California in Tapia canyon of the Sierra Madre, the winch being mounted on a movable frame in which were gold-saving devices similar to those on a dredge. Light excavators have been tried in Arizona, and in Mexico, and probably in a great many

other places, and apparently they have all had a very similar record of failure. The attention of engineers might advantageously be directed to the design of small as well as large gold-dredging appliances. The field is extensive in both directions.

New Theory of Bed-rock Concentration of Gold.

THE concentration of gold in river-gravels always tends toward enrichment at 'bed-rock', or at intermediate clay-partings in the drift. This simple fact of observation is not as easily explainable as might appear at first sight. The analogy of concentration in a sluice is of only limited application. The concentration of coarse gold in the steeply-inclined upper reaches of a stream, where the entire mass of gravel is subject to frequent disturbance and rearrangement by floods, depends, of course, upon the same principle as that which the hydraulic miner has always employed. The concentration of gold in what are known as 'high-banks' is also comprehensible. This represents the deposition in eddies during periods of high water. The phenomenon is peculiar to all gold-bearing districts that are subject to sudden floods. The distribution of gold in 'fans', where rivers debouch from narrow valleys upon a plain, is referable to the scour of a river channel in which concentrations of gold had previously taken place, and the zones of superior enrichment through such 'fan-deposits' apparently represent successive deep-scourings of the upper valley by extraordinary floods. The accumulation of gold almost invariably in larger relative amount on the bottom of the channel is not so easily accounted for. The actual turning over of the deep gravel-fill, as sand and gravel are moved forward in a sluice, demonstrably has not taken place. We have seen drill-holes penetrate the valley-fill to depths of thirty-five to forty-five feet through coarse sand, containing no pebbles larger than two inches diameter, without revealing a single gold 'color' until bed-rock was reached. Also, in a middle-Californian valley-deposit, we have seen an exactly similar phenomenon occur both on 'false-bottom' and on the true bed-rock twenty feet below it. Manifestly, the principle of sluicing has not applied in such a case. In a recent bulletin of the New Zealand Geological Survey, Mr. James Park discusses the concentration of gold in river-gravels in a very able manner, but he does not grapple with the peculiar problem we have stated here, although an extension of his explanation of the progressive settlement of gold through gravel subject to movement in a current of water is all that is needed to adequately account for the phenomenon. We must conceive a change in conditions, however, which involves a consideration of movement infinitely slow as compared with the flow of wet sand on a steeply-inclined channel. We know that the soil-covering, which may be more accurately, because more broadly, denominated the 'regolith', as suggested by Mr. George P. Merrill, is not transported to lower levels exclusively by means of wash from the run-off of the rain-fall, but when saturated with water does actually flow not unlike a viscous body. This phenomenon has also been pointed out by numerous students of soils, both in America and abroad. The same movement is indicated as a characteristic of sand and gravel-fills of river-channels, and even of broad valleys. It may be compared to the slow, steady, persistent, downward movement of a glacier. This movement has largely escaped detection, most likely because it was unsuspected. Even Mr. Park, after his critical study of gravel deposits, has failed to note it. This is probably because the opportunities to study very flat sandy valley-fills by means of a sufficient number of bore-holes to afford data for safe generalization, have not been frequent. The case is not yet absolutely demonstrated to the point of determination of velocities of movement of water-saturated sandy valley-deposits, and observations extending over considerable periods of time are needed. But the fact of such movement has been clear in our own study of placers, and corroborative testimony will no doubt be forthcoming from others. Our attention was first directed to it from discrepancies in checking old surveys across bottom-lands consisting of typical Californian valley 'wash', which were being drill-tested for gold. The divergences showed such persistent deflection in the direction of the slope of the valley as to awaken suspicion of a uniformly operating cause not attributable to errors in surveying. A mobile mass of sand and gravel, moving steadily forward, would necessitate such variations in interstitial spaces between the grains as to facilitate the gradual subsidence of gold particles along curved lines theoretically similar to those of the trajectory of a projectile, as indicated by Mr. Park in the more mobile gravels of a shallow channel. The difference between the two cases is merely one of degree, but the 'glacial creep' of an apparently stationary deposit involves a new conception. It undoubtedly exists, and it is evidently competent to produce concentration of heavy minerals toward the bottom, given the time which Nature takes for her leisurely processes.

SILVER COIN is always a troublesome article for governments to regulate. It refuses to stay fixed in value, and so it offers peculiar opportunities for juggling in exchange. Spain has for some time been afflicted with an unusual form of silver speculation. The five-peseta piece, known as a *duro*, very nearly equivalent to the American dollar, has been counterfeited to such an extent that over $15,000,000 worth of the spurious coin is estimated to be in circulation. This so-called 'Seville dollar' not only simulates the legend, obverse and reverse, of the legitimate *duro*, but tallies with it precisely in weight and fineness. The difficulty in the matter is that the counterfeiter and not the Government reaps the profit, and this is no trifling seigniorage. The Government ordered the seizure of all 'Seville dollars' presented in payment of duties and taxes, for which the gold value of the coin would be returned. As only an expert could distinguish the false from the true, the merchants declined to receive *duros* at all. The result was a blocking of the wheels of retail trade, and the Government was forced to hastily rescind the order.

Personal.

E. B. KIMBALL has gone to Alaska.

W. F. COPELAND is at Caribou, British Columbia.

T. A. RICKARD and SCOTT TURNER are at Nome, Alaska.

WALTER W. WISHON, of Los Angeles, was in Chicago last week.

JOHN A. REID, of Stockton, was in San Francisco this week.

JOHN NOYES, of Butte, is visiting his brother at Candle, Alaska.

C. S. HERZIG is in Nicaragua on examination work for London clients.

H. A. SHIPMAN, of Denver, was in San Francisco Thursday of this week.

JAMES W. ABBOTT was in New York last week, on his way to Pioche, Nevada.

R. H. RICHARDS, of Boston, is inspecting different mining camps in the West.

HOWARD W. DUBOIS will go to Dawson, Yukon Territory, about September 1.

CHESTER A. THOMAS is resident manager for the Yukon Gold Co., at Dawson.

C. W. PURINGTON is in Vladivostok and will examine placer mines at Ochotsk.

J. A. HOLMES, of the U. S. Geological Survey, is visiting England to study coal-mining methods.

GEORGE A. TWEEDY, general manager of the Minas del Tajo, Rosario, Sinaloa, is in San Francisco.

F. G. FORESHAW, of the staff of the Barranca mines, Sonora, Mexico, was in San Francisco this week.

ARTHUR W. JENKS has gone to Alaska on professional business. He will be gone until the middle of September.

MARTIN FISHBACK has returned to El Paso from Chihuahua, where he has been examining mines for a New York company.

J. E. SPURR has been making an examination of the West End mine, at Tonopah, with a view to planning future development work.

E. E. ELLIS, late of the Oliver Iron Mining Co., has been appointed geologist to the Tennessee Coal & Iron Co., with headquarters at Birmingham.

GEORGE H. ASHLEY and E. F. LINES, of the U. S. Geological Survey, are engaged in a re-survey of the Indiana coalfields, in co-operation with State Geologist BLATCHLEY.

GEORGE OTIS SMITH, director of the U. S. Geological Survey, has returned to Washington from an inspecting trip through Wyoming and Colorado, where extensive surveys of the coalfields are being carried on.

Obituary.

DONALD RAY MORGAN, who died at Iguala, Guerrero, July 25, after a short illness with smallpox, was a mining man well known in Mexico. He was a native of Massachusetts and came to Mexico about ten years ago, spending some time south of Mexico City and later accepting a position with the American Smelting & Refining Co. in the Saltillo district; from there going to the San Pedro mine, at Diente, near Monterrey; after which he associated himself with the Torreón Metallurgical Co., and was instrumental in their taking over the Voladora mine, which he managed with great success. He soon after became the consulting engineer to the same company, developing many of its properties, two notable ones being the Cabrillas, near Saltillo, and the San Diego, at Santa Barbara, Chihuahua; at the latter Mr. Morgan installed a large concentrating mill. Two years ago he resigned to devote his time to private practice, and to the Mexican Mines Syndicate, in which he was largely interested. He leaves a widow, who had accompanied him on his trip into Guerrero, and who was with him at the time of his death.

Latest Market Reports.

LOCAL METAL PRICES—August 13.

Antimony	12@16c	Quicksilver (flask)	$42.50@43
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.95@ 5.00c	Tin	32@33½c

ANGLO-AMERICAN SHARES.
Cabled from London.

	Aug 6. £. s. d.	Aug. 13. £. s. d.	
Camp Bird	0 12 6	0 12 9	ex div.
El Oro	1 5 6	1 6 3	
Esperanza	3 3 9	3 11 3	
Dolores	1 10 0	1 10 0	
Oroville Dredging	0 9 6	0 8 6	ex div.
Stratton's Independence	0 1 0	0 1 0	
Tomboy	1 3 0	1 5 0	

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Aug. 6.	Aug. 13.
Amalgamated Copper	81	79¾
American Smelting & Refining Co.	94¾	97¼
Boston Copper	14¼	12¾
Butte Coalition	29	27½
Cumberland Ely	9⅝	9⅛
Dolores	7⅛	7¼
El Rayo	2¾	2¾
Giroux	4	4¼
Greene-Cananea	12½	11⅝
Indiana Sonora	5	5⅛
La Rose	5½	5⅝
Miami Copper	9⅛	10¾
Nevada Consolidated	15⅝	14⅞
Newhouse	7¼	6⅝
Nipissing	7½	8¼
Ohio Copper	2¾	3
Tennessee Copper	38¾	38⅝
Utah Copper	42⅝	44¼
Yukon	5¼	5⅛

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, August 13.

Atlanta	$ 27	Manhattan Con	9
Belmont	1.10	MacNamara	63
Booth	48	Midway	43
Columbia Mtn.	26	Mohawk	13.00
Combination Fraction	1.40	Montana Tonopah	1.50
Daisy	77	Nevada Hills	1.75
Fairview Eagle	40	Rawhide Queen	60
Florence	3.52½	Sandstorm	33
Gold Bar (Bullfrog)	4	Silver Pick	23
Goldfield Con.	6.70	St. Ives	34
Gold Kewanas	39	Tonopah Extension	88
Jim Butler	30	Tonopah of Nevada	7.80
Jumbo Extension	56	Tramp Con.	21
Laguna	1.25	West End	65

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. August 13.		Closing prices. August 13.
Adventure	9	Michigan	12½
Ahmeek	79½	Mohawk	67
Allouez	37	Nevada Con.	14⅞
Amalgamated	79⅞	North Butte	84
Arcadian	4	Old Dominion	39¼
Atlantic	14	Osceola	110
Bingham Con.	50	Parrot	26½
Boston Con.	12½	Phœnix	50
Butte Coalition	27½	Quincy	90
Calumet & Arizona	122¼	Rhode Island	4¼
Calumet & Hecla	670	Santa Fe	2
Centennial	31½	Shannon	15⅞
Con. Mercur	43	Superior & Pittsburg	14⅜
Copper Range	78	Tamarack	74
Daly-West	10½	Trinity	19½
Franklin	12½	United Copper Con.	11
Granby	103	Utah Copper	43¾
Greene-Cananea, ctf	11½	Victoria	5¾
Isle Royale	22½	Winona	7
Mass.	6¾	Wolverine	143

Engineering Societies.

The Canadian Mining Institute invites members of the profession in the United States to join in its summer excursion, the itinerary of which was given in our issue of July 18. H. Mortimer Lamb, secretary of the Institute, whose office is at 413 Dorchester street W., Montreal, will be glad to furnish details to anyone interested.

The Seventh International Congress of Applied Chemistry will be held in London, May 27 to June 2, 1909. Wm. Macnab is secretary of the organization committee, and his address is 10 Cromwell Crescent, London.

General Mining News.

ARIZONA.

COCHISE COUNTY.

Among the interesting developments of the Warren district during the week was the initial hoisting operations at the new electric plant of the Copper Queen Co. at the Sacramento shaft, through which all Copper Queen ores will be hoisted, and the blowing in of one of the new 500-ton furnaces at the Douglas smelter of the Calumet & Arizona Co. The converters have all been moved to the opposite side of the main smelter building to make room for the additional furnaces. With the installation of the two new stacks, work will immediately begin on the enlargement of the old furnaces, which when completed will give them a capacity of 500 tons each, and the entire smelter all the efficiency and capacity of a 3000-ton plant. The new hoisting plant and its accessories will completely revolutionize the Copper Queen's methods of handling its large bodies of ore.——One shift has been laid off at the Virtue adit, near Paradise, and progress is unusually slow, due to an extremely hard rock which has lately been struck. The adit is now in 320 ft., and it is expected the vein will be reached within 20 ft.——The production of copper for the month of July at the Douglas smelters was larger than for any previous month this year. The total was approximately 12,250,000 lb., of which the Copper Queen produced 8,000,000 and the Calumet & Arizona 4,250,000.

GILA COUNTY.

The forces of the Copper Creek Co., near Winkelman, are now engaged in laying foundations for the large 500-hp. plant. The boiler and all the machinery, as well as the dynamos and other electrical apparatus, are on the ground. It is expected the plant will be put into service by the middle of September. When this has been accomplished, the hoists and pumping machinery on the various mines will be operated by power contributed by this plant. There are 35 men working on the construction.——Work has ceased on the American Eagle group of mines on account of water, which cannot well be controlled until the electrical plant furnishes the power for the pumping. The 60-ton concentrator is now in transit, and it is expected it will arrive in time to be erected and put in operation about the time the construction of the power plant is completed. Several buildings are being erected at Sycamore Flat for the housing of employees, a boarding-house, and company store; the latter has already been established at that point.

GRAHAM COUNTY.

The New England & Clifton Copper Co. has suspended shipments from the Antietam mines. The ore is being blocked and left in the mine. Suspension of shipments, however, has not interfered with sinking of the shaft, which work is now being pushed more rapidly than before. ——The New York-Arizona Gold Copper Co. continues to push forward development work on its claims. There is now considerable talk about the installation of a small stamp-mill, which in all probability will be erected within the next few months.

MARICOPA COUNTY.

Luis Killeen and associates have purchased 15,000 shares of the Buffalo-Arizona Co., paying the full par value of $1. ——The manager of the Buffalo & Arizona mine, near Morristown, has gone east to purchase a 20-stamp mill, a new hoist, and other machinery. After September 1 a force of 18 men will be employed at the mine.——The 100-ft. crosscut at the Slocum Copper Co.'s mine, near Phoenix, has been pushed through to the old Slocum shaft, where a large body of high-grade ore was found. The working force has been increased, with the intention of thoroughly developing the mine in anticipation of the construction of a mill, for which the company is now trying to raise funds.

MOHAVE COUNTY.

George and Hubert Smith are at work on the old Lookout mine, about four miles south of Kingman. In former years the mine produced a large amount of rich ore, but of late years it was allowed to lie idle. It is the intention of the owners to run a drift below the old workings and after timbering the ground, sink the shaft to a depth of 100 ft. Considerable milling ore is opened up in the bottom of the old shaft and below the caved ground.

YUMA COUNTY.

A new company, headed by George Mitchell of Los Angeles, has been formed to work a consolidated group of claims lying near Big Williams Fork. The concern is to be known as the Clara Consolidated Gold Copper Co., and is capitalized for $3,000,000. It is reported that a mill will be built on the Clara claim.

CALIFORNIA.

MARIPOSA COUNTY.

Paul Stockton, of San Jose, is opening up a large marble quarry near the Yosemite Valley railroad. The marble is of the finest quality, and grades from the dark, almost black, to a light mottled color.

NEVADA COUNTY.

(Special Correspondence).—Within a week the work of unwatering and re-timbering the shaft at the Idaho-Maryland will be under way. Three shifts will be employed. A large force will also be put at work re-opening the 700-ft. level and running a drift to strike the vein. The new vein on the 500-ft. level has been proved for 250 ft. and has widened to 10 ft. A west drift from the 500-ft. level is opening virgin country.——The Calvert & Sharp gravel mine, near Canada hill, has been bonded to Hannan, Murphy, and associates, of San Francisco. The adit will be driven ahead 200 to 300 ft. to strike the channel.——A. Becker, of San Francisco, has bonded the Bluejay and Extension properties near Maybert. Considerable development work is planned. ——Work will shortly be resumed at the Gaston mine, and a portion of the mill kept running steadily. The adit is in 1400 ft., with about 2500 ft. to run. Progress is being made at the rate of 6 ft. per day.——Arrangements are being made to resume operations at the Orient mine. Eastern people are interested. The Mayflower mine, at Canada hill, has been bonded to Honolulu parties.——George Hothersall and Frank S. Morgan, of Nevada City, have bonded the Lost Emigrant mine, near Summit.——At the Buckeye, a drift is being run to develop a promising ore-shoot and to eventually connect with the Cold Springs channel.

Grass Valley, August 10.

PLACER COUNTY.

Work at the Azalea has been temporarily stopped.—— The agent of a San Francisco company is negotiating for the group of quartz mines owned by the Robert Waugh Co., and the gravel mine of Morgan & Green near Bold Mtn. ——W. S. Fletcher has made the second payment on the Home Ticket mine. He has also begun the extension of the Blackhawk adit, near Forest Hill.——Lawrence & Gaylord have driven their adit a total distance of 300 ft., and expect to go at least 100 ft. farther. The material is a talc and is so soft that augers are used in removing it.—— Work on the Hidden Treasure continues with 40 men. The sawmill is now running to fill the big orders of W. S. Fletcher for flumes along the line of the old Breece & Wheeler ditch.

SHASTA COUNTY.

The Balaklala Co. has taken an option on the Rogers store and store-building at Coram, with a view to going into the mercantile business when the smelter starts. The Company plans to also open a store at the Balaklala mine.—— It is reported that the Hazel Mining Co. will increase the capacity of its 20-stamp mill at French Gulch, making it a 30-stamp plant. The Company employs 110 men at its mine and mill.

SIERRA COUNTY.

Chick & Aldrich have bonded the Buttes Saddle mine and are receiving bids for driving a 1000-ft. adit. It is reported that they will also fix up the mill and operate it.——L. H. Holley, who last year purchased the Chipps mine, has interested a number of Eastern people and is now preparing

for a thorough overhauling and renovating of the mine and mill. Mr. Holley expects to have the stamps dropping by October.——It is rumored that the Keystone will be started up again after a close-down for repairs.——The Plumbago mine has recently put in new compressors and dynamos. ——Asa Wilson has purchased the interest of his partner, Jason Frye, in the gravel property near Mt. Vernon.

SISKIYOU COUNTY.

(Special Correspondence).—Negotiations between the United States & British Columbia Mining Co., of Boston, and Wintering & Osgood, for the purchase by the former of the Big Cliff group of claims on Russian creek, Salmon River district, were broken off last week on orders from Boston, greatly to the surprise of their representative, who had experted the property and made a very satisfactory report. Mr. Osgood arrived from Seattle Saturday and a new deal is pending. The Wintering strike is probably the best prospect in this county. The vein is 20 ft. wide, the pay-streak assaying $25. Other parties are waiting to secure options on the property if the present deal is declared off.——Operations along the Klamath river are extensive this summer. Cleveland and San Francisco capitalists have a prospecting drill at work on the Croy ranch, with a view to installing a dredge. This company has options on Woodrat bar, the Wm. Quigley ranch, and several other river ranches known to be underlaid with placer gold. ——J. A. Brent, who, with a party of California capitalists, recently filed on the bed of the Klamath river for a distance of many miles, will soon have a suction dredge at work below Hamburg bar. The timbers are being hauled to the site now.——G. H. Coffin, of Terminal Island, Cal., closed a deal last Saturday for the purchase of the Mississippi placer mine, on the Klamath river at the mouth of Grider creek. W. T. Grider has worked this property since the 'sixties,' sluicing only when he wanted money. Some seasons his clean-ups netted enough to carry him along for several years, and the mine would lie idle until his funds ran low. The new owners will work the property on a larger scale. The price paid was $13,000.

Yreka, August 10.

TUOLUMNE COUNTY.

The men who have a bond on the Sonnet have started work.——The Jumper mine, at Stent, is again working. The force will soon be increased.——It is reported that S. L. Bright has sold his Dutch property and that the new owners will start work at once.——The shaft of Arbona is being unwatered and the mill repaired. The development will be centred on the 100 and 300-ft. levels.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Work was resumed this week upon the driving forward of the Prudential adit, Republican Mtn., the portal of which is in the corporate limits of town. The bore is now in 750 ft., and the Magenta vein should be reached in a few feet. It is the intention of the company to equip the property with a heavy compressor-plant, the power to be secured from the Two American Sisters M., M., P. & E. Co. plant. W. C. Hood, of Georgetown, is general manager.——A contract was awarded this week for the extension of the Montgomery Ward adit another 100 ft., and work has already been started. This property is situated on Republican Mtn., the bore being in over 600 ft. The first vein to be reached is the Pay Rock Extension. ——A payment of $50,000 on the $200,000 purchase price of the American Sisters mine was made August 1. Jas. A. Mears, representing a syndicate of New York capitalists, is satisfied with the past development of two months, and as a result will start more extensive developments.—— Adams & McClusky, leasing on the Aliunde through the Ocean Wave level, have shot into an 8-in. streak of ruby silver and gray copper, assays of which are as high as 450 oz. silver. A winze is being put down, and as soon as the ground has been opened to a depth of 50 ft. driving and stoping will be started.——The Raymond adit is being driven steadily forward, being now in 900 ft. Another vein has recently been reached, which is heavily mineralized, and as soon as the hanging wall has been reached driving will be started both east and west.——The Domino adit, on Paynes peak, is now in 450 ft. A lode was recently intersected, but after driving 40 ft. the hanging wall has not been reached. A number of streaks of galena ore have been struck that are from 2 to 3 in. wide. H. Cochran is manager.——Reports from the Daily and Atlantic districts are to the effect that there is a genuine boom in evidence. A total of more than 200 men are at work, with more going in every day. The Coffin mine seems to be making the best showing, and shipments are being made direct to the smelters at Denver. In the lower adit the orebody is from 5 to 8 ft. wide, the average content being about $35 per ton in silver, lead, and zinc.——T. Cunningham, manager of the Revenue Extension M. & M. Co., put a force of men to work this week upon the Star property, in the Peru district. Operations are being carried on through the Mallary level of the Revenue workings. The Revenue was worked up to the east end-lines, a streak of ore being left that is from 8 to 16 in. wide. Driving is to be started to open the ground.——The United Hydro E. Co. has entered into a contract with the Central Colorado E. Co. for supplementary power-service, by which all possible power requirements of Clear Creek and Gilpin counties will be supplied. The plant of this Company is at Georgetown, but by the terms of the contract a sub-station is to be erected at Idaho Springs, at which point excess power will be delivered by the Central Colorado Co. The transmission line is now being run to Denver, and electricity will be furnished by November 1, 1908. Fred P. Dewey, of Georgetown, is manager.——Two carloads of smelting ore are being shipped each week from the Black Eagle mine, on Chicago creek. The ore is a medium grade, returning from $23 to $25 per ton in gold. Operations are being centred on the fourth and sixth levels.——J. G. Roberts, of Idaho Springs, is building a complete ore-sorting and concentrating plant at the Jackson mill, which is to be put up at the Lamartine dump. Through this device the entire dump matter is to be treated. Mr. Roberts recently took a long-time lease on this property, and purposes reducing the material only to such a grade as to make a good milling matter, which will be delivered at the Jackson mill for final reduction. It is estimated that there is nearly 200,000 tons of this material available at the mouth of the adit.——The Krupp M. & M. Co., operating the Belmont, on Saxon Mtn., has resumed work after a close-down of two months. The adit is being driven ahead, and a number of stringers of heavy lead ore are exposed in the breast. The bore is in 450 ft., and from surveys the junction of the Friar Tuck will be reached in a few feet.

Georgetown, August 10.

GILPIN COUNTY.

During the past week Emery, Holmes & Co. shipped a carload of smelting ore from their lease of the San Juan mine, on Quartz hill, to the Argo plant, in Denver, which is expected to run between one and two ounces gold per ton.——A car of concentrate was shipped from the Penobscot mill, in Gamble gulch, to the Argo smelters, by the Moffat road last week, and another will be shipped out this week from the Champion mill, on Beaver creek.——The recently incorporated Union City M. & M. Co. has purchased the Wiedmann property, near the Apex divide, and has already started the construction of a shaft-house and foundations for hoisting engine.

LAKE COUNTY.

In accordance with the plans of the management and lessees, the No. 4 shaft of the Ibex property, on Breece hill, was closed down with the completion of the work of the last shift on Friday of last week. Men are now at work getting ready for the necessary repairs, the arrangements including much re-timbering and an entirely new foundation for the engine. Three weeks will be required for the completion of the work.——A. W. Moon, of Denver, has secured control of the Foremost adit, on Chief Mtn., near Frisco, and will start operations in a short time. The old adit has been driven into the hill a distance of more than 800 ft. Mr. Moon contemplates prospecting the ground

through which the bore has passed. There are several places from which he thinks shipments can be started.——Work has been started on the Moyer dump, in California gulch. This material is sent to the plant of the American Zinc Extraction Co. It contains a sufficient quantity of zinc to make the operations on the old dump successful. A small force of men is employed.——Lou R. Johnston and his associates who have taken a lease on the Tribune property, on Breece hill, have started prospecting through the Yak tunnel. Their work is being done at a depth of 1300 feet.

OURAY COUNTY.

George Crawford was in Ouray last week, accompanied by L. Gentry, of Chicago, who, Mr. Crawford claims, will advance the money to pay off all indebtedness and start work at once.——The Mickey Breen will re-open within the next two or three weeks, according to recent dispatches. The upper workings of the abandoned property will be developed, and it is expected that the Breen will be a dividend-payer after the work is well under way.

TELLER COUNTY.

A test run was started last week at the mill on the Stratton's Independence, for the purpose of determining the best method of treating some of the ores produced from the mine. At the conclusion of these tests, and possibly one on the sulphide ores, it is reported that the big mill will start actual operations.——The total length of the Roosevelt deep-drainage tunnel is now 2873 ft. During the month of July a distance of 203 ft. was made, which shows a falling off from previous months. This is accounted for to a great extent by the extreme hardness of the rock in the heading, which has been almost impossible to break. However, new machines are being used, and with new steel better progress is being made, and it is probable that during the present month the required distance will be made.

IDAHO.

BONNER COUNTY.

(Special Correspondence).—The crew at the Panhandle smelter will be increased this week from 50 to 100 men, and with all possible speed the improvements in the plant will be pushed. A visit of inspection was made last week by several officials of the Montana Mineowners' Association, which will furnish most of the ores. The plant will be ready to blow in within another month.——J. C. Hague, of Spokane, is incorporating a new company to operate his group of claims on Trestle creek. The claims have been under development for several years and are thought to have good orebodies in galena.——The MacNickolas-Watts Mining Co., which has been purchasing mining property in this region for some time, has recently taken over 12 claims on Garfield bay of Lake Pend d'Oreille. They are said to have invested $200,000 within recent months.

Ponderey, August 8.

IDAHO COUNTY.

(Special Correspondence).—The Hogan mine plant is to be doubled, making it a 40-stamp mill, and cyanide tanks added. The mill is running steadily, and it is stated that $230 per day is being cleaned up, although the mill is operating on low-grade ore.——The Black Diamond claim has been purchased by Spokane men and is now under development.——The Emogene, a quartz property, is being developed by a small crew, and a saw-mill is being erected near the property.——The Buster shaft is being sunk as rapidly as possible. F. W. Bradley is expected to visit the mine in a short time, and it is said he may decide to have a power plant built for extensive development.

Dixie, August 8.

SHOSHONE COUNTY.

(Special Correspondence).—The Democratic State convention, which was held in Wallace last week, developed several items of interest to the operators of the State. The convention split into two factions, nominated two tickets, and adopted two sets of resolutions, but both factions were unanimous that some legislation was necessary in connection with the industry. Both adopted planks pledging themselves to the enactment of an employers' liability act and providing for protection to mine-workers. The plank in the platform of the faction known as the anti-Dubois faction reads as follows: "The State has no higher function to perform than to adequately protect the lives, persons, and property of its citizens. So believing, we favor a more efficient law requiring the owners of mines to adopt safe and sanitary means in the prosecution of such business, to the end that danger to the lives, persons, and health of those engaged therein may be reduced to a minimum. We further favor the division of the State into such mining districts as may be necessary for convenient and efficient administration of such laws." The pro-Dubois resolution is worded as follows: "We favor the segregating of the State into such mining inspector's districts as may be necessary to require all mines in this State to be kept in a safe condition and giving the inspectors full authority to enforce their demands by criminal action against any owner, lessee, agent, manager, or other person in charge of any mine or mine-workings; and imposing a fine or imprisonment or both for any failure or neglect to comply with the directions of the inspector." Both factions have also pledged themselves to the enactment of a law providing for the settlement of disputes between capital and labor. The anti-Dubois faction nominated Harry L. Moore, editor of *Mines and Metals*, for State Mining Inspector, and the pro-Dubois faction nominated John Pressley. Both are men of this county, and the choice as to which shall be accorded the right to run will, of course, be decided by an appeal to the courts. W. H. North, of this county, is certain to receive the nomination for this office on the Republican ticket. ——The annual meeting of the stockholders of the Snowstorm mine, at Mullan, was held at the beginning of the week, and two changes made in the directorate, P. J. Kline, of Helena, Mont., being chosen to succeed J. B. Greenough, of Spokane, and James Bean, of Mullan, being chosen to succeed William J. Hunter, of Moscow. In discussing the affairs of the Company, T. L. Greenough, the president, refused to make any statement as to dividends. The mine is now working 110 men, of whom 80 are underground, and ore is being shipped at the rate of 400 tons per day. Mr. Greenough was unwilling to state whether or not the fact that he and his associates had gained control of the Panhandle smelter would affect the shipments from the property.——In a statement issued by the management of the Nabob Mining Co., the Company declares its intention to resume work in the near future and to erect a concentrator at the mine. A full description of the workings of the mine is given, showing the extent and nature of the discoveries on each level. It is calculated that there are now about 50,000 tons of ore on the dump, and about 500,000 tons in sight. The Company is in a good condition financially, and steps are about to be taken toward the securing of a patent for the ground.——A forest fire is raging in the vicinity of the Charles Dickens mine, near Wardner, and in addition to a large quantity of standing timber, cut wood to the value of several thousand dollars has been destroyed. The Charles Dickens mine has been especially unfortunate in connection with fires of this sort. Only a few months ago the Company's mill was destroyed in this way, and had to be replaced at a cost of more than $20,000.——A rich strike of lead-silver ore is reported to have been made in the Full Moon property, near the Great Western, at Burke. This strike was made at the foot of a 50-ft. shaft, the full breadth and width of which is in carbonate ore carrying streaks of silver ore assaying as high as 300 oz. per ton. The management has decided to run a long adit to get under this ore at a depth of about 450 ft., and work will be commenced as soon as the necessary machinery arrives.

Wallace, August 8.

(Special Correspondence).—The Rex mine is entangled in financial difficulties and suits that will probably prevent its expected resumption of operations for some time. It had excellent showings in clean shipping galena when it closed down several weeks ago.——An assessment of 2½ mills per share has been levied on the stock of the Sonora

mine for carrying on development work. The mine is an old location and has much development.——Two shipments of ore for test purposes have been made by the Bullion mine to the Tacoma smelter, with good results. The shaft is being sunk to reach the 300-ft. level, where a copper shoot is expected.——The Canyon Creek Fraction has uncovered two streaks of galena, several inches wide on the foot and hanging walls. The width of the veins has not been discovered.——A contract for 100 ft. of tunnel work on the Silver Mountain has been let to W. W. Bradley.——An assessment of 3 mills per share has been levied on the stock of the Park Copper Mining Co., for development purposes.——The Amalgamated Stock Holding Co. has been organized at Wallace, to operate a group of six claims on Pine creek. Good galena showings are said to have been made.——The Capitol Mining Co., on Two Mile creek, is driving a 2200-ft. adit to tap its vein at a depth of 2000 ft., which is 500 ft. below the present workings. Some high-grade galena has been struck.——The Idora Mining Co. has paid off the last of its $12,000 mortgage and will resume operations shortly. Work will be carried on in the adit, which has crossed one lead and is being pushed on, and also in driving on the vein. Hand-drilling will be used this fall, and in the spring, machinery will be installed. ——A contract for 240 ft. of tunnel work on the Amazon-Dixie has been let. The property has good galena showings, and has shipped a small amount of ore.

Spokane, August 10.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—A considerable advance in the price of zinc ore marked the week's ore sales, the 'assay base' ranging from $34.50 to $36 per ton for 60% zinc. An unusual demand for ore was noted among the buyers from Wednesday to the end of the week. The total value of the lead and zinc output for the week was $196,714.——The American Beauty No. 2, south of Webb City, and the Yellow Dog, the largest plant north of the city, have closed down indefinitely on account of the low price. A number of plants have started up again, after a brief shut-down, and many others are contemplating an early re-opening and are engaged at present in unwatering the mines. The Midway ground, northeast of Joplin, where a number of rich properties were located, is to be opened at once. The Evans Mining Co. has taken over the old Pearl C. plant and, with adjoining companies, is draining the ground. The Red Fox, an adjoining property, will also be re-opened. The latter has a 200-ton mill, and both properties are worked at the 130-ft. level.——The Midnight mine, west of Joplin, one of the richest of the younger properties, is to be re-opened after several months' shut-down. The drill showed that the entire lease is underlaid with rich ore, and an old water-course penetrated by the shaft showed very rich galena and zinc-blende in the walls of the natural cave. ——The Columbia mine, in the same locality, is to be re-opened by Bendelarie & Cook. The old shaft, down to 140 ft., will be sunk 11 ft. deeper to catch a lower and richer run of ore recently found. A concentrating plant is on the ground.——The Engineers' Zinc Co., at Webb City, one of the largest plants belonging to Frank Nicholson, will start work at once in the north Webb City field. Plans were made to re-open early, but a delay was necessary on account of installing some new machinery.——The past fortnight has noted a number of rich strikes throughout the district. At the Stewart mine, in Bellville, a shaft has been completed into the lower run of ore at 150 ft. The ore is zinc-blende, and though only a small amount of development work has been done, the ore taken out seems to indicate a large deposit.——The Florence Mining Co., operating a lease north of Turkey creek, has made one of the richest strikes of the past few months. A shaft penetrated a rich body of zinc-blende at 75 ft., developing a 27-ft. face of ore. A second shaft showed a 25-ft. face, and a third shaft entered the orebody at 14 ft., striking silicate, zinc, and galena. A mill is on the lease.——The Martha E. mine, near the old Newsboy cave-in, is proving a valuable property. Seven drill-holes on the 10-acre lease show ore. The shaft is breaking into ore at 160 ft. A drift will be run at 190 ft. Two 11-in. pumps have been installed to handle the water, which is a more serious question since the shut-down of the American Beauty. The deeper deposits are zinc-blende, while the shallower runs are galena.——T. N. Davey is having his land near Porto Rico drilled. The drill penetrated ore from 130 to 150 ft., and later from 150 to 200 ft. encountered a good run of sheet-ore. The ground will be divided into 10-acre tracts and sub-leased for mining purposes.——The Ground Floor Mining Co. moved the mill to the west part of its lease and is now sinking two shafts and taking out rich ore. During the low ore prices the Company developed the ground, employing only a few men, but the force has recently been increased.——Large pumps have been installed at the Needmore, in Oronogo, where a rich strike was recently made by the Granby M. & S. Co. It will take some time to drain the ground. The ore was struck at 170 ft., continuing to 250 ft. The upper levels will be sub-leased by the present Company, which is reserving the deeper runs for its own use. One drill-hole entered the ore at 10 ft. and continued in ore to 251 ft. A mill will be built.——The Alba camp is becoming quite active again after the financial flurry. A number of companies are prospecting and developing the leases, both in the old camp and farther northwest, along Spring river. The Quick Seven Mining Co. is perhaps the most active at present. A steam-hoist and derrick are being installed, as well as a lift-pump. The ore is being cleaned upon hand-jigs. The Company has bought all the timber on the lease.——The Holton Mining Co. has opened up a rich deposit of zinc-blende in a drift run west from the shaft. The ore was struck within six feet of the shaft, and the drift heading is now out 20 ft., with rich ore showing on every side.——The Riverside Co., adjoining the Quick Seven, has begun sinking its shaft deeper to catch the run lying below the present drifts.——A number of new mills are being built or planned in the district. The Coahuila L. & Z. Co., at Porto Rico, has let the contract for a 300-ton mill, and work on the plant will be begun at once. The mill will be on the Horton land, near the Church-Mitchell lease. Seven drill-holes on the 20-acre lease showed ore at 200 ft. A double-compartment shaft is being sunk, in which the skip system will be used.——The Waddell Mining Co., northwest of Carthage, has erected a 100-ton mill on a 40-acre lease. The orebody lies at a depth of 75 to 120 ft. A stope 35 ft. high has been developed, showing good milling ore. Steady operation will be begun at once, as the trial run of the mill has been successfully made.——The Endeavor Mining Co., on the old Prudential lease, has completed its 250-ton plant and now has one of the best equipped mills of that capacity in the district. The new shaft is being rapidly sunk, while the old shaft has been fitted up with air-lines ready for operation. A few more days will be required for the adjustment of the machinery, and the mill will then be run steadily.——A 250-ton mill has been completed at the Lucky Jim, west of the city, but will not be run until ore prices advance.

Joplin, August 8.

LAWRENCE COUNTY.

(Special Correspondence).—It is reported that every drill in the Aurora camp is active. A number of rich strikes have been made, especially on the land of the Federal L. & Z. Co. Shallow strikes show galena and the deeper ones show rich zinc-blende.——Scott & Coleman have developed a tract east of the city showing a run of zinc-blende at 250 ft. A shaft was started and reached the 160-ft. level before it was abandoned on account of water. Recently the work was again taken up and heavier machinery installed. The machinery will form a part of the concentrating equipment. This land adds about 240 acres to the present productive area of Aurora.——The Black land is the scene of a prospecting and development campaign. This land has been one of the best producers of Aurora, having shipped over 15,000,000 lb. of lead ore in seven years. The present development bids fair to place the land in its rank among the leading producers.——One of the richest strikes in Au-

rora was made recently by the three Murphy boys upon the United Zinc Co.'s land east of the city. A shaft was put down 25 ft., when a run of galena was struck. Huge chunks of the ore, from the size of a bucket to fine particles, were taken out. No driving has been begun and the extent of the deposit is unknown. The shaft and lease were sold, but the adjoining lots were reserved, where a second shaft will be sunk at once. The phenomenal richness of the ore and the youthfulness of the boys making the strike have attracted wide attention.

Aurora, August 8.

NEVADA.

ESMERALDA COUNTY.

The Blue Bell mine, six miles east of Walker Lake, has been bonded to the Hazen Lumber Co. for $20,000, the entire amount to be paid in one year. The Hazen people now have six leases on the property.——Jesse Harrington and Mike Noff are making a trail from Lapham Meadows to Frund's camp, in Cat Creek. They have some very promising mines near the top of Mt. Grant, and as soon as the trail is finished will install a 10-stamp mill. The ore is free-milling gold and the 2-ft. vein runs from $50 to $500 per ton.——E. M. Hadley and A. L. Leitch have secured a lease on a block 300 by 600 ft. on the Black Butte No. 3 claim of the Diamondfield Consolidated, at Diamondfield, and are sinking with two shifts.——Free gold ore has been found at the new camp of Nichols, four miles west of Buena Vista, in the White mountains. The find was made on the Langley & Acton lease on the Golden Gate claim, at a depth of 250 ft.——The Mohawk Jumbo has re-entered the shipping list and is shipping 160 tons of ore per day. Five machine-drills and 100 men are at work.——A test shipment of two tons of ore will be made this week from the Hamlen lease, on the Millsap property, to the Stewart stamp-mill at Sodaville. The Millsap property is about 12 miles southeast of Hawthorne, at Summit station on the Bodie stage road.——The Plymouth Mining Co., operating the Sprague lease on Blocks 6 and 9 on Combination No. 3 of Consolidated ground, started operations again this week, after a temporary shut-down, pending the awarding of a new contract for sinking.——The mines of Goldfield produced during the week ending August 8 a total of 2001 tons, estimated to be worth $181,905. During the same period the Tonopah mines produced 5995 tons, of an estimated value of $153,025.

EUREKA COUNTY.

The Eureka M. & L. Co. made a shipment of 26 tons of ore to the Utah smelters last week, and another will be made soon. The mine is six miles south of Eureka, on what is known as Secret Canyon summit. The owners, Chord & Locke, are purchasing equipment for a 20-ton cyanide plant.——The suit of Gibson & Stewart *v.* Pardy & Brierly, in the District Court of Eureka county, involving the ownership of the Fanny or Beehive claim, was decided by Judge Breen in favor of the defendants.——The old Holly mine, 2½ miles west of Eureka, is having its buildings put into shape for active work later on. It is now owned by the Nevada Development & Mining Co. A headframe has been erected over the 200-ft. shaft and three buildings have been constructed—a machine shop, compressor-house, and a building for a 25-hp. gasoline hoist.

HUMBOLDT COUNTY.

The new camp of Chafey, formerly known as Dun Glen, is 18 miles southwest of Winnemucca and 9 miles east of Mill City. It is reported that a boom is on, and that town lots are selling at from $400 to $1000. The principal mine is the Mayflower, where from the 'Black Hole' E. S. Chafey has quietly taken out about 1000 tons which have returned $100 per ton in gold and a small amount of silver. G. C. Austin is moving his stamp-mill from Central camp, 22 miles to the north.——The George & English lease on the Fine Gold property, on Badger hill, at Seven Troughs, has been extended for two years. It is reported that George Lowden, of the Wihuja lease, has purchased an interest from George & English in this bonanza.

LINCOLN COUNTY.

B. S. Nunn has sold a one-half interest in the El Monica claim, at Pioche, to Robert McLaughlin for $1600. A number of men have been put to work extending the adit, which starts from Main street. The remaining one-half interest belongs to Robert Schofield, of Pioche.——The installation of the gasoline engine has been completed on the Pioche-Pacific property, and two shifts have been started to work. The plant is modern in every particular, and will permit of the shaft being sunk to a depth of several hundred feet. ——The camp of Kendall is attracting considerable interest, due to the fact that shipments are to be started to the Needles smelter. This new camp is 22 miles due south of Searchlight. The famous Piute Springs are 4½ miles to the west. Camp Leadville is five miles farther south, and Chiquita and Juniper are, respectively, 5 and 10 miles to the east.

NYE COUNTY.

A new compressor has been ordered by MacNamara, and no time will be lost in installing it as soon as the machinery arrives, when several more machine-drills will be put in operation. The regular work will be continued in the western part of the mine, from which all ore has been extracted since the suit was begun.——The sinking of the Mizpah shaft and drilling from the bottom of the Red Plume shaft of the Tonopah Mining Co. continue, and good progress is being made in both workings. Having plenty of ore blocked out to keep their 100-stamp mill running for a long time, the management is devoting much of its time to the gaining of depth, and thus proving up its ground far below the present workings.——The Manhattan Con. Co. has resumed operations, and at present the work of raising from the 200-ft. level is in progress. As fast as the ore is taken out it is being hauled to the Peterson mill for treatment. The company has a 1500-ton contract with the reduction company.——The Manhattan Gold Bar Co. has put two men at work sinking a shaft on its estate and development will be rushed.——The Springdale mill, at Beatty, is rapidly nearing completion, and will begin operations next month. The plant is the property of the Springdale Mining & Milling Co., and may handle some custom ore in addition to company ore.

WHITE PINE COUNTY.

The mill of the Stuart Gold Mines Holding Co., at Cherry Creek, was formally started recently. The mill is equipped with four Nissen stamps, Pierce amalgamator, Callow screens and tank, and Wilfley and Frue vanners. The plant will handle custom ore, as well as the Company's own ore. ——Three shifts are now working at the plant of the Steptoe Valley Smelting Co., at Smelter, and three converters are in commission. The mines are shipping about 1500 tons per day, 1000 of which comes from Copper Flat and 500 from the Cumberland Ely.——The Giroux is putting another pump into the Alpha shaft, in anticipation of a much larger flow of water at any time.

MEXICO.

William C. Seddon, of William C. Seddon & Co., and other capitalists of Baltimore, Md., have obtained control of a vast tract of mining property, 1,500,000 acres, in Mexico, through which runs the Cananea, Yaqui River & Pacific Railroad. They also have got control of the Douglas Copper Co., at Fundicion, Sonora, Mexico, who have completed a copper and gold smelting plant. It costs $15.75 per ton to produce electrolytic copper, according to Theodore Douglas, president of the Company. On a basis of 5.64% copper recovered, with copper at 13c. per lb., and $9.63 per ton gold and silver, the ore has a gross value of $23.67, from which, after deducting the cost of production, $15.73, leaves a net profit of $7.94 per ton.——The San Rafael Mining Co., Pachuca, has let the contract for a new plant for the treatment of the slime to White & Newcomb, metallurgical engineers, of Mexico City. This will be the largest slime plant in Mexico.——Cia. Explotadora y Beneficiadora de Metales de Zacatecas, Zacatecas, will erect a concentration and cyaniding plant. A. C. Luck, engineer for the Company, is making tests in Denver of a shipment of the ore.

Special Correspondence.

LONDON.

Wheal Kitty Production and Development.—Prospects of Tyee Copper Co., Vancouver. — Troubles of the Dunderland Iron-Ore Co., Limited.

Some six months ago I referred to J. H. Collins' work in re-opening the Wheal Kitty, one of the old tin mines in the St. Agnes district of Cornwall, and mentioned that while certain companies in Cornwall were spending large sums on modern plant and making no profit, Mr. Collins was more than meeting his expenditure by means of what superior people are apt to call out of date methods and machinery. The succeeding six months' work, that is to say, the first half of the current year, has fully confirmed Mr. Collins' expectations, and the mining operations have yielded a substantial profit, in spite of the fall in the price of tin. The six months' output of ore has risen from 3337 tons to 5303 tons, and the amount of concentrate sold rose from 54½ tons to 101 tons. The average yield increased from 37 lb. to 43 lb. per ton, while the price fell from £96 to £88. The total income rose from £5241 to £8949. The mining expenses during the last half year were £5995, royalties £446, directors' fees and management £414, leaving a balance of £2378. A thousand feet of development has been done, and the lodes opened up are very promising. In order to put the mine permanently on a paying basis it is highly desirable to sink the main shaft an additional 500 ft., and properly equip it. It would also be of advantage to extend the dressing-plant. These two objects can be gained by the expenditure of £10,000. I ought to mention that the issued capital is only £22,000. of which £13,000 was purchase price, and the remainder working capital. Of the profit made during the last half year, only £825 is being distributed as dividend, being at the rate of 7½% per annum, and the remainder is being placed to the fund for carrying out the proposed new work. It is to be hoped that shareholders and others will come forward with the new capital. It will all be spent economically, and on lines adapted to Cornish mining, and none of it will go in experimental work on electric pumps.

The readers of the MINING AND SCIENTIFIC PRESS are kept well posted by your local correspondents as to the doings of the Tyee Copper Co. at Vancouver Island. This property is owned in England; the largest shareholders, in fact the controlling factors, belong to the Siemens group. Though the mine was closed in October last, the smelter has been put into a strong position for custom-work, and the capacity is now being doubled. The strong point in the Company's favor is that steamers call at Ladysmith, where the smelter is situated, for coal, and there are great inducements for shippers to send ore there by these steamers. The policy of the Company is to get into contact with and to offer special facilities to ore producers in British Columbia and Alaska, and from all we hear there seems to be strong probability of large supplies coming forward from these districts at no distant date. The chances of doing business with Mexico and the United States are not so great, owing to the existence of smelters nearer at hand. The Company is fairly well supplied with working capital, and has a reserve fund of £80,000, besides which the individual members of the Company would readily come forward with funds to secure smelter contracts whenever the opportunity may occur. At the present time the smelter is not working up to its capacity. During the year ended April 30 the furnace was in blast 187 days, and treated 42,807 tons of ore, of which 6040 tons came from the Tyee mine and 36,767 tons was custom-ore. No roasting is done, as most of the ore received contains no excess of sulphur. Whenever the sulphur content is high, a low-grade matte is made, and afterward fed back into the furnace. The product of the furnace during the year was 3975½ tons of matte, averaging 39.9% copper, 18¾ oz. silver, and 18 dwt. gold. This was all shipped elsewhere for refining. In all probability, later on, the Company will do its own refining.

One of the most unfortunate mining speculations ever entered into by English investors is the Dunderland Iron Ore Co., Ltd., which was formed seven years ago to acquire large tracts of low-grade iron-ore deposits in Norway. The method of dealing with these ores comprise Edison disintegrators and Edison magnetic concentrators, after which the cleaned ores have to be briquetted. The Company was promoted by Sir Joseph Lawrence (who, by the way, introduced the linotype machine in this country) and it was supported by a number of leading iron-masters in the north of England and South Wales, who recognized the advisability of exploiting new sources of ore-supply. The Company enjoyed for a time great popularity, owing, to a large extent, to the magic of Edison's name. In this country Edison is supposed to be the most wonderful and successful inventor that ever existed. There were not a few people who prophesied disaster when the Company launched out on such a magnificent scale to operate untried processes. At first £2,000,000 capital was issued. Afterward £500,000 debentures were put forth. Then another £500,000 of second debentures were offered for subscription, but hardly any were taken up. Finally, this year, a loan of £30,000 was raised on the security of prior-lien bonds, which have to be issued somehow or other this year. The directors are now trying to issue £100,000 worth of pre-preference shares, and there appears to be very little chance, especially in the present state of the money market, that any response will be made. Altogether the Company is in a parlous state, or, in the words of the satirist, 'in the devil of a mess.' The technical difficulties encountered by the Company have been varied and continuous, and at every meeting of shareholders some different excuse had to be given for the want of progress. First it was the unexpected cost of building the railway; then the original method of briquetting had to be abandoned and new experiments made; afterward the crushing plant had to be reorganized; and later on the concentrators had to be modified. At the present time the chief difficulty is that labor is unobtainable, owing to the unpleasant conditions set up by the fine dust. An effort is being made to modify the transporting apparatus, which is the chief offender in kicking up a dust, and Mr. Robins, of belt fame, has been commissioned to suggest changes. The Company is also confronted with the cost of production in relation to the state of the iron-ore market. The cost at present is estimated at $5 per ton, and it happens that the market-price for similar raw-ore is only $4.50. The costs do not include interest, maintenance, and depreciation, but all the same, the directors cling to the hope that when the estimated output of 300,000 tons per year is attained, the costs will be lowered, and a sufficient profit earned. The policy of the directors is now to close down the works entirely until the new conveyors are erected, and until the market for iron-ore improves. I don't know whether the necessary money, some £75,000, for the new conveyors will be raised or not. Altogether the outlook for the Company is about as black as it can be.

TORONTO, CANADA.

Report of Canadian Department of Mines.—Iron Possibilities in British Columbia.—Electric Steel Production at Niagara.—Silver Discoveries in Montreal River District.

The Mines branch of the Canadian Department of Mines has issued a report covering the fiscal year 1907-08, and giving, in addition to statistical information previously published, the results of investigations carried on by its officials as to the mineral resources of Canada.

Einar Lindeman, who made an examination into natural and other conditions in British Columbia, bearing upon the feasibility of establishing a large iron industry, a project which has been entertained for some time by extensive capitalists, reports concerning the iron-ore deposits of Vancouver and Texada islands. He states that the magnetites of Texada island and at Head bay, Klaanch river, and Quinsam river in Vancouver island, are sufficiently ex-

tensive to supply a blast-furnace for many years. These ores are high in iron and low in phosphorus, and though as a rule they have high sulphur content, that element is not present to a sufficient extent to unfit the ore for smelting. Ample fuel is assured, as the coal output of Vancouver island for 1907 was estimated at 1,325,000 tons, and coke to the extent of 17,000 tons was produced. This coke contains 15 to 16% ash, but this could be reduced to 12% by more careful separation of the shale. Limestone is abundant and of excellent quality, and the raw materials are conveniently situated for transportation, should a furnace be established anywhere on the Coast. The high price of labor is a noticeable drawback, and another consideration to be borne in mind is the necessarily limited nature of the British Columbian market for some years to come, which may make it necessary to find an outside market for the surplus output. The report devotes some attention to the electric smelting question, with a view to the solution of the problem of producing steel directly from the ore. It is thought that the technical difficulties hitherto encountered may be met by the application of the Lash steel process to the electric furnace. Success has attended experiments with this process made by the Canadian Lash Steel Process Co., of Niagara Falls, in an open-hearth furnace, indicating its possibilities with regard to electric smelting. In this process, finely divided ore is mixed with carbon, a certain quantity of finely divided iron, containing much carbon, such as cast-iron borings or granulated pig-iron, sawdust, and fluxes. By the open-hearth 'ore-process,' a mixture of approximately 75% pig-iron and 25% iron-ore can be worked up, but in the Lash process a much larger percentage of ore can be used with a small proportion of iron rich in carbon. A typical mixture has the following percentage composition. Iron-ore, 54; cast-iron borings, or granulated pig-iron, 27; sawdust, 4; limestone, 4; coal tar, 3; coke, 2; total, 100. When these are finely divided, intimately mixed, and heated to a high temperature, the reactions that occur are similar to those in the open-hearth furnace using the 'ore-process.' In using the Lash mixture in the open-hearth furnace, it is necessary to have a bath of molten metal, otherwise it could not be heated to the temperature required to produce reaction without losing carbon. But with the electric furnace no difficulty of that kind is experienced, since the gas in an electric furnace is neutral, in contradistinction to the oxidizing atmosphere of an open-hearth furnace. The great economy of the process lies in the substitution of a large amount of ore for pig or scrap-iron. Experiments in using the Lash mixture in the electric furnace have been made on a small scale with successful results, the yield of metal amounting to 98% of the metallic content of the mixture. While the average cost in Canada of the raw material for producing 100 tons of steel ingots in an open-hearth furnace is $20.75 per ton, the cost of using the Lash mixture in an electric furnace is given as $16.22 per ton. Different electric furnaces are being tested to ascertain the type best adapted for the application of the process.

A very large amount of prospecting has been done in the Montreal River area, but comparatively little development work has been accomplished this season, owing mainly to want of capital, together with transportation difficulties. One of the most advanced properties is the Shirley Cragg location in Smythe township, where 25 men have been at work. Test pits have proved the occurrence of native silver, and the vein has a width of 3 in., while much of the wall-rock will make milling ore. The Moose Horn mines, in the Montreal River area have passed into the hands of a New York syndicate, which will thoroughly develop the property. The Lower Lorraine camp is rapidly progressing. New buildings are being put up on the Keeley property, where 35 men are engaged in development work. The Haileybury Silver Mining Co.'s main shaft is down 85 ft., the vein at this point showing good silver content. Both the Keeley and the Haileybury will install machinery during next winter. T. H. Torrance, recorder of the Montreal River district, will in the near future move his office from Latchford to Elk Lake.

MEXICO.

Merger of Mexican Central and Mexican National Railways. — West Coast Line Operating to Culiacan.— Railway Matters in Northern Mexico. — Heavy Shipments of Smelting Ores. — Greene Gold-Silver Difficulties in Ocampo.—Pinos Altos Mill.

The articles in the proposed new mining law that limit the rights of foreigners and foreign companies, continue to receive attention, but the excitable stage seems to have passed. In the meantime railroad and transportation subjects are largely to the fore. The most important of these, of course, is the merging of the Mexican Central and Mexican National into the National Railways of Mexico. Early in June it was reported that over two-thirds of the merged lines had been turned in, and that in the course of the following month, after the return from New York of Pablo Macedo, the Government's representative on the National railroad, the new company would be organized and take over the actual management of the consolidated roads. This has not been carried out in full, however. The new company has been organized, and E. N. Brown, president of the old National lines, has been made president of the merged lines, the National Railways of Mexico, but the management has not yet been taken over, and will not be until after the issuance of the greater part of the new securities. Of the Southern Pacific's Guaymas-Guadalajara line, the extension from Guaymas was completed and the first train run into Culiacan, Sinaloa, on July 23, amid great enthusiasm, though a heavy storm prevented the demonstration that had been planned. At the Guadalajara end the track is being laid on the first 12 kilometres out from Orendain, and the construction company has been ordered to double its force, now consisting of 1000 men, so as to keep the grading advancing rapidly, and complete the road into Tequila, about 25 miles from Orendain by November. On the Guanajuato Mineral Belt railroad, the force has also been increased in the effort to finish the road this year, and many of the tunnels have been eliminated, and a surface route taken instead, with the same end in view, that is, completion this year. On behalf of the Rio Grande, Sierra Madre & Pacific, now running between Juarez (El Paso), and Nuevas Casas Grandes, in Chihuahua, it is stated that H. R. Nickerson, president and general manager, formerly vice president of the Mexican Central, and one of the best posted railroad men in Mexico, has raised $5,000,000 with which to continue the road from its present terminus to the junction with the Kansas City, Mexico & Orient, and then on to the Pacific, though there is also rumor that E. H. Harriman has obtained control of the Sierre Madre, and will continue it on to the Pacific from Nuevas Casas Grandes as part of his Cananea, Rio Yaqui & Pacific line.

At the Chihuahua plant of the American Smelting & Refining Co., the second furnace has been blown in, and everything is running smoothly, with the most encouraging results, and an abundant supply of ore is being received. The ore receipts from Mexico at the El Paso plant of the American Smelting & Refining Co. are also increasing and the reserve stock is being added to daily. This has been brought about partly by a number of new contracts recently made, and a slight increase of production all along the line, but more particularly by the renewal of shipments by the Potosí & Chihuahua Mining Co. on its usually heavy scale, after almost a complete shut-down of two months, which had been made necessary by the breaking of the main shaft of the Potosí hoisting engine, which has just been repaired. Mining in the Ocampo district of Chihuahua has received a terrible black eye by reason of the deplorable condition of the Greene interests, which has resulted in the closing of the Sierra Madre Land & Lumber Co.'s saw-mill at Madera, which is practically a subsidiary of the Greene Gold-Silver Co. This leaves the people in the lumber camp destitute. Likewise the closing of the Concheño mine, and consequent dismissal of a large number of men adds to the hardships in the district. Concheño had developed into an excellent property under the

former owners, Corrigan and McKinney, of Cleveland, Ohio, to whom it may now revert back, as something like $1,000,000 is still due from the Greene company. Beyond Ocampo is the Pinos Altos Mining Co., which latter is preparing for the erection of an immense concentrating and cyanide mill, orders having been given last fall, but later held up because of the general monetary crisis. The concession held by Greene for the prospecting rights over some 3,000,000 acres in the western part of Chihuahua expires early in December, and it is not believed that in his present financial condition he can obtain a renewal or extension, so the immediate future prospects for new work in this part of the country are really brighter than they have been for some time back.

BUTTE, MONTANA.

Amalgamated Copper Co's. Production.—Davis-Daly Estates Re-organization.—Butte & Superior.—Treatment of Zinc-Copper Ores.—Butte & Balaklava.—British Butte Dredge.—

The Amalgamated Copper Co. produced in July 20,000,000 lb. of copper from the Washoe smelter, representing the output of all the Amalgamated companies, the North Butte, and the Butte Coalition. It was the record-production of the Washoe smelter, and at the lowest cost per pound in the history of the plant. The cost of production by the Washoe is gradually being lowered by the introduction of new economies, and by treating a larger amount of ore. Formerly, when the record output was between 15,000,000 and 17,000,000 lb. per month the Washoe employed 3000 men with a monthly payroll of $300,000. Now, with a production of 20,000,000 lb. it employs 2000 men at a cost of $215,000 per month. Formerly the plant handled an average of 9000 tons of ore per day; now it takes 11,750 tons, but that is about 1750 tons more than the normal capacity, as the plant is being crowded to its utmost limits on account of the shut-down of the Boston & Montana smelter at Great Falls. The latter plant will be repaired by September 1, and all the Boston & Montana ore will be shipped to Great Falls again. The Boston & Montana output has, since the first of June, been limited to about 40% of the normal, because of the Great Falls smelter being out of commission. The Company is shipping about 1800 tons of ore daily to the Washoe. The North Butte Co. is mining about 1400 tons of ore per day, shipping to the Washoe. Half of the quantity is first-class and half second-class ore. The July production was 4,125,000 lb. of copper. The Butte Coalition is confining its mining to the Rarus and Minnie Healey mines, and is shipping 850 tons of ore to the Washoe daily. The Anaconda Co. is operating all its mines at normal capacity, with the exception of the St. Lawrence, the output from which is restricted on account of gas coming from the fire in the old stopes, which interferes somewhat with mining on the upper levels. The Parrot Co. is sinking the Little Mina shaft deeper, and is cross-cutting on the 2100-ft. level of the Parrot mine. The Company is mining about 400 tons of ore per day, but the average yield is not much in excess of 3% copper.

Richard R. Vail, for eight years in the engineering department of the Amalgamated Copper Co., has been appointed superintendent of the East Butte Copper Mining Co. Mr. Vail has also been with the Pittsburg & Montana Copper Co., the mines lying just east of those of the East Butte. Mr. Vail served the Amalgamated under John Gillie, and the latter and other head officials of the Amalgamated have a high opinion of Mr. Vail's ability. His appointment may be regarded as significant of the friendship of the Amalgamated and other big companies for the East Butte.

The Davis-Daly Estates Copper Co. is carrying on development work in the Colorado mine in a small way, but all other properties of the Company are closed, awaiting the efforts of F. Augustus Heinze, chairman of the executive committee, to re-finance the enterprise. According to the plans discussed the stockholders will have to provide the funds for a rehabilitation. The idea seems to be to organize a new company, and levy an assessment of $2 per share.

On some recent buying from Duluth, the stock of the Butte & Superior Co. advanced from 87c. to $1.10, but there is nothing in the development at the property to justify such an advance; nor is there any better prospect for opening a copper mine than there was months ago. The Butte & Superior has opened a big vein of zinc ore, but it has little commercial value because it can not be shipped and treated at a profit. In that respect the Butte & Superior is no different from other Butte companies having similar zincky ore.

La France Copper Co. is still experimenting with the Steele dry process zinc separation, but it is not certain that it will succeed. In a small way at an experimental station in Texas the system works perfectly, but like many other processes it failed when put into actual and constant use. The trouble seems to lie in the complexity of the Butte zinc ores, and in the high percentage of minerals that are lost in the dust from the plant. The ores carry zinc, lead, iron, copper, gold, and silver, and the percentage of neither zinc nor lead is high enough to make it profitable to mine the ore for either, with the other associated by-products. However, the combined value is high, probably three times that of ordinary copper ores. There is so much of this kind of ore in Butte that a solution of the problem would make Butte the greatest zinc as well as copper camp in the world. The cost of transportation and the high charges made by the zinc smelters are other reasons why the zinc ores cannot be mined profitably at present. The smelters demand that the concentrate run a certain percentage of zinc, and to bring the product up to that point increases the loss by dust. The ore carries considerable gold, but the zinc smelters will pay only $9 per oz. for the gold in the concentrate, the plea being that the gold is simply another hindrance to zinc smelting and requires additional handling, the zinc smelter not being equipped for extracting gold. Until a zinc smelter is built at Butte the zinc ores cannot be mined at a profit. Several years ago the Montana Copper & Zinc Co. tried another dry concentration method at the Alice mine and proved it a success on a small output, but as soon as an attempt was made to operate it on a large and paying scale it failed because of the increased care and attention required. Before its plant was destroyed by fire the Montana Copper & Zinc Co. changed its system by the introduction of a partial wet method of concentration.

The Butte & Balaklava Copper Mining Co.'s stockholders, at a meeting recently, voted to pool the stock. The purpose of the arrangement is not quite apparent, the unique explanation being made for publication that the purpose of pooling the stock with a board of trustees is to keep the control of the property in the hands of the present management, and prevent any rival company from getting hold of the stock, taking possession of the property, and shutting down operations. The six acres of ground of the Butte & Balaklava had been peddled on the market a long time before North Dakota and Minnesota farmers were induced to take it. The latter capitalized the six acres for $2,500,000, and eventually unloaded on R. B. Dear and his associates. Development work has been carried on for a year, but with no important results. It is claimed that 127,637 shares out of 210,000 outstanding have been pledged to the pooling agreement, or 22,636 more than a majority. The trustees authorized the issuance of trustee certificates to shareholders in place of the stock certificates, which will be negotiable on the market in the same manner as the actual stock, the only restriction being that the trustee certificates will carry no voting power, the latter remaining with the trustees for the purpose of retaining control of the management of the Company.

Several large reserve dams have been built on the British-Butte ground, and preparations are being made to install the big dredge, which is being built in San Francisco. The dams hold a combined capacity of about 10,000,000 gal. of water in reserve for dredging purposes. The dredge will be one of the largest in the world. It is expected that the plant will be in operation by the first of next October.

TONOPAH, NEVADA.

Settlement of 'Apex-Suit' between McNamara and West End. — Ore Discoveries.—Mizpah Shaft.—Belmont and Montana Reports. — Financial Conditions.

The most important event which has taken place in Tonopah in many months has been the settling of the 'apex-suit' between the West End and the McNamara companies, which took place on July 24. The settlement was a 'jug-handle' one in which the McNamara got everything asked for. This is the end of a suit which was started in December 1906, when the West End enjoined the McNamara from taking out ore from a vein vertically under the McNamara claims, but which the West End contended 'apexed' on their ground. The case never came to trial, but was to have been heard on August 3. There has been a small army of lawyers, experts, surveyors, and owners working on this case for several months past. The leading lawyers were Curtis H. Lindley for the McNamara, while the lawyers for the West End were Peck and Solinsky and W. E. F. Deal. The experts were C. H. Moore, J. W. Chandler, and A. C. Lawson, of the University of California, for the McNamara, and Mark B. Kerr and Wm. H. Shockley for the West End. It is thought that Josiah E. Spurr, who has been in camp for the last two weeks, was working for the West End. The agreement is that the workings of each mine shall be confined to the ground within vertical side-lines, and that extra-lateral rights shall be abandoned. This decision means much to Tonopah, and will allow free development in these two mines where large bodies of ore are known to exist, and where there is probability of finding much more. Vigorous work to determine the apex of the ore has already led to valuable discoveries. Especially interesting is the finding of ore on the western boundary of the McNamara on the 300-ft. level within 10 ft. of the Ohio Tonopah claims, which now belong to the West End. This gives great hopes of the discovery of orebodies far west of anything now known in Tonopah. It was certainly a wise move on the part of the managers of these two companies to settle the suit amicably, and it is to be hoped that their example may be imitated in other apex-suits.

This discovery of ore by the McNamara has called attention to the territory west of the producing mines of Tonopah, and may have influenced the sharp legal battle now in progress for the possession of the Red Rock and McKane mines. At present these properties are being held by armed men for the Tonopah Extension. The Tonopah Banking Corporation also lays claim to them under a lien. It is likely that this matter will soon be settled and work resumed. The question of ownership is complicated by the fact that the boundary line between Nye and Esmeralda counties passes through the two mines. Tonopah is watching with bated breath the sinking of the Mizpah shaft of the Tonopah Mining Co. This shaft is to go to the 1500-ft. level. It is to prospect the ground below the rhyolite-dacite intrusion, which cuts off the pay-ore in most or all of the Tonopah mines at a depth of about a thousand feet, or at an altitude of about 5500 ft. above the sea. This shaft is now down nearly 1000 ft., and is being sunk at the rate of 75 ft. per month. The mining men of Tonopah blame the former president of the Tonopah Mining Co. for the failure to prospect this mine in depth when it was in bonanza several years ago, when the expense would not have been felt.

The managers of the Belmont company think they have found good ore below the intrusion, but local engineers disagree on this point. Nearly all of the mines have found quartz-lodes below the intrusion, but though these lodes are strong, often 50 ft. wide and continuous for several hundred feet on the strike, they have thus far proved nearly barren. Assays from the quartz have usually shown 2 to 3 oz. silver per ton, and in only a few cases have assays as high as 10 oz. been obtained. The Montana company is running a long north cross-cut to prospect under the twelve claims it owns north of its present workings. All of these workings, in what may be termed virgin ground, are important, and discoveries in any of them will give a great stimulus to mining in Tonopah. I have lately been interested in comparing the annual reports of the Belmont and of the Montana companies. Both own mines in Tonopah, but the Belmont mill is at Millers, twelve miles away by railroad, while the Montana mill is in Tonopah. The first thing noticeable is the cost of power at the Belmont mill, $36.35 per month per hp., or $404.20 yearly. This cost was to be reduced by the adoption of electric power from the Nevada California Power Co. The total cost per ton for milling is given by the Belmont report as $7.825 per ton. on a total of 34,484 tons. To this must be added about 70c. for transportation, making a total cost of $8.525 per ton. Against this cost the Montana reports for milling 15,748 tons, a cost per ton of $4.12. This shows a difference of $4.405 in favor of the Montana mill. The Montana ore, if there is any difference, is possibly more difficult to treat than that of the Belmont. The Belmont mill is now running some of its stamps on ore from the West End, Midway, and other Tonopah mines. Their minimum charge is about $12 per ton for treatment. It is evident that if the Montana mill begins to treat ore it can soon put the Belmont out of commission.

Business is quiet in Tonopah, but there is a much better feeling than prevailed a few months ago, and a sharp revival of business is looked for this fall. Many men are returning from Rawhide, and some of the other overboomed camps. There has been little re-building in the part of town which was burned a few months ago. Work on the large hotel, which was stopped at the beginning of the panic in October 1907, has been resumed and it will soon be opened. The banking situation has been straightened out. The Nye and Ormsby Bank, thanks to the efforts of its president, Frank Golden, has weathered the storm, and will pay off all deposits in full, beginning January 1, 1909. The State Bank has given up and is now in the hands of a receiver, whose drastic report shows great mismanagement. The Tonopah branch is especially condemned for its open-handed loaning of the bank's funds. The other two banks are in good condition.

JOHANNESBURG, TRANSVAAL.

Breaking Records in Shaft-Sinking. — Expanding Activities of the Chemical, Metallurgical & Mining Society. — Total Transvaal Mineral Production. — Amalgamation of Village Deep and Turf Mines.—Rand Metallurgical and Milling Standards.— June Gold Output

An era of record-breaking continues to prevail upon the Rand, and we are experiencing an endless succession of new standards of attainment in gold yields, working costs, dividend declarations, in recovery percentages, stamp duties, and other respects, both industrial and metallurgical. In underground work, where improvements have been no less creditable, records can be compared with no such mathematical precision as is possible with the results obtained in surface departments. The definite operation of shaft-sinking, though certainly governed by many varying factors, has lately been the means, however, of providing a striking illustration of the high level of efficiency maintained below the surface. Last year, it may be recalled, a record was made in the sinking of the Brakpan 7-compartment vertical shaft 204 ft., from 1690 to 1894 ft., in one month. This same mine has now created a new record by the sinking of its incline from the bottom of the vertical shaft at 223 ft. in the month, with sill-timbering. The size of the incline is 19 by 7 ft., and the angle of inclination 8 or 9 degrees.

Following upon the decision of the Chemical, Metallurgical & Mining Society to appoint corresponding members of council in various mining countries abroad, another effort to extend the scope and utility of the organization is being made by the establishment of a branch in Rhodesia, where it is hoped that periodical meetings will be held for the discussion of local technical affairs, with special advantage to the gold industry of that country. Of the

Society's thousand members, nearly 10% are domiciled in Charterland. In a land rising so speedily in importance in the mining world, and confronted with such a diversity of complex problems, the benefits of a more ready interchange of knowledge and experience would be incalculable. Expansion has been largely stimulated by the influx of small capitalists of Rand experience, who have often been found to repeat mistake after mistake merely for the lack of knowing the special difficulties of their predecessors and the means by which troubles have been overcome. The amount of practical information available for intending operators in regard to mineral occurrences or working conditions, is at present deplorably meagre. Apart from gold, the production of metals—as in the Transvaal—is of small account. A report now issued by the Secretary for Mines for 1907 shows the principal yields to have been in value: gold, $10,676,000; silver, $98,900; copper, $32,800; lead, $67,000; coal (actual sales), $269,500; chrome iron, $98,000; and gems, $136,000.

After years of fruitless negotiation, a scheme has now been evolved which will shortly lead, almost without doubt, to the amalgamation of the Village Deep and the Turf mines. The combined operation of the two, the former being a producing mine with a heavy debt, and the latter, in the shaft-sinking stage with big costs, has been the acknowledged aim of the shareholders in both concerns, but the relative valuation of assets has been a difficult matter. The Village Deep is now crushing about 28,000 tons per month with 180 stamps, for a return of less than $7 per ton. If the amalgamation scheme is carried out, the crushing capacity will be speedily raised, and the full benefits of the large-scale practice will be gained very soon. Financial considerations appear, however, to be the chief factors in favor of the consolidation.

The mill and cyanide works to serve the far greater amalgamation in the East Rand, the Simmer Deep, are progressing steadily and appear upon inspection to be sure of completion before the stipulated date of September 1. The first sod was cut about eighteen months ago, but as the commencement of producing operations is dependent upon the uncompleted power-station of the Victoria Falls Power Co., and upon the readiness of the mines for stoping, no pressing haste has been necessitated. The mill, of 300 stamps, as now erected, is not only to serve the Simmer Deep, a property aggregating about 1500 reef-bearing acres in extent, but also the Jupiter. Thus we see this single installation serving an area comprising, a year or two ago, six independent deep-level mines. The great magnitude of the area served by this one plant, more than twenty times the holding of the Crown Reef or Ferreira, gives the concern special significance, but the results of operations will be watched by none with greater interest than the metallurgist. For the characteristic of magnitude marks even the units of the plant itself. Constructed principally of steel, the battery, which has already had a trial run, comprises 300 stamps of no less than 1670 lb. each, which will be further weighted up if required. In spite of this great weight, anvil blocks are not adopted. The boxes rest upon concrete foundations of over 100 tons, with merely a ¼-in. rubber cushion between, and are held by easily accessible bolts. Each unit of 10 stamps is driven by a 40-hp. motor and independent counter shafting. Below the mill, the pulp is to be classified by means of cones, the peripheral overflow of which is more efficient than that of the more common pyramidal boxes, separating out the product for the tube-mills, of which four, 5½ by 22 ft., are in course of erection. The cone overflow runs into collector-vats of 50 ft. diam., of which there are ten installed; treatment-vats are of somewhat larger dimensions. The slime-plant consists of 13 enormous conical vats, the largest in South Africa, of 70 ft. diam., and 12 ft. high at the sides, increasing to 17½ ft. in the middle. The whole plant, at present considered to stand on a 72,000-ton per month basis, is laid out with special regard to the requirements of probable expansion and with magnitude in all units, appears to embody the leading principles of advanced Rand mechanical metallurgy proved successful by W. A. Caldecott upon the plants of the Consolidated Gold Fields under his control. Even allowing for the absence of a power-generating plant, which the scheme of purchasing electricity allows, the methods of mill construction have led to a very substantial saving in capital expenditure per stamp, in comparison with other installations. Heavy stamps and high duties, with auxiliary tube-mills, are now the order of the day upon all Consolidated Gold Fields properties. At the Luipaard's Vlei Estate over nine tons per stamp per diem is recorded, with stamps of 1550 lb., or considerably less than the minimum specified for the Simmer Deep. The importance of the tube-mills is well shown by the Simmer & Jack mine, where the shaking-tables below these re-grinders win from 10 to 15% of the gold recovered from all sources.

The declaration of the June output at 574,973 fine ounces for the Transvaal, being 8000 oz. below the May total, is satisfactory in view of the shorter working time. Considered from the standpoint of the actual rate of production, the industry records a yield of 19,116 oz. per day for June as compared to 18,774 oz. for May. The profit aggregate for 49 leading companies is maintained at approximately $4,380,000. After being several months the lesser producer, though always the premier profit-maker, the Robinson has regained its position of prominence over the Simmer & Jack, with 26,450 oz. as against 25,995 oz. The Robinson Deep comes third, with 20,898 oz. Labor returns show no appreciable change, the month's native recruiting brings in 93,600 'boys', with a net gain of 375.

The position of Sidney Jennings, formerly consulting engineer to Eckstein & Co., has been filled by H. Stuart Martin. This appointment has caused surprise in some quarters in view of Mr. Martin's complete lack of local experience in Rand mining problems, his high reputation having been built up in the world of British coal mining. The reduction of working costs underground appears to be the foremost task to which the new chief advisor will be called upon to apply himself.

SALT LAKE, UTAH.

New Two-thousand Ton Mill of Ohio Copper Co. — Large Tonnage of Ore Developed.

Much satisfaction is felt over the resumption of work at the Ohio copper mine, in Bingham, following the announcement that the bonds authorized by the Board of Directors some months ago had been underwritten. Colin McIntosh, the general manager, who had been in the East for five months, returned on August 6, with instructions to proceed with the project without delay. The mill, the initial capacity of which is to be 2000 tons of ore per day, could be made ready within 90 days, as the building is completed and practically all the equipment, excepting a battery of Wilfley tables, is on the ground, and the latter has been ordered. It will take a little more time to get the mine ready, as the Mascot adit is to be continued another 300 ft., when connection will be made with the upper workings of the mine by means of a raise to the main double-compartment shaft. The Mascot adit is to be used for transportation purposes, and it is figured that the costs of moving ore to the place of milling near its portal will not exceed 15c. per ton. The present main mill-building is 317 by 391 ft., and is of steel construction; the slime plant, 115 by 342 ft., is also of steel, and similar to the main building. Both were erected by the Minneapolis Steel & Machinery Co., and cost approximately $240,000. The mill will be equipped with two 24 by 16-in. jaw-crushers, four 20 by 6-in. jaw-crushers, eight 26 by 15-in. rolls, 144 jigs, sixteen 7-ft. Chilean mills, and 382 Wilfley tables. The slime-plant will be equipped with 72 Wilfley slime-tables, 180 Callow tanks, and 12 buddles. The mill is divided into four separate sections, each driven by independent motors. All machinery is of the latest design, to insure low costs of operation and maintenance. The Company owns 1480 acres of ground in the vicinity of the mill, which is to be used for a tailing dump. When completed the mill will represent an investment of a little more than $1,250,000.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Boiler scale $^1/_{16}$ in. thick probably causes a loss of 13% of the fuel burned under the boiler, and the same scale if $^1/_8$ in. thick will cause a loss of 60 per cent.

Gold telluride does not volatilize below 1100°C. In a current of air, however, less than 0.1% of gold in an alloy with tellurium will be volatilized. Gold in alloys with lead, copper, and other metals is volatilized along with them, and corrections have to be made for such losses in bullion assays.

An air-lift pump is an uneconomical device unless the different parts are correctly proportioned. All dealers in compressed-air machinery supply such apparatus, but a home-made lift would not give satisfactory service. More economical use of air could be made by delivery to an ordinary steam-pump. Greater efficiency can be attained if the air be preheated by passing through a coil in a small sheet-iron box stove.

Gold solvents are few in number, as compared with the solvents of all the common metals, except platinum. The two cheapest solvents are potassium or sodium cyanide, and chlorine. The latter used in solution for leaching gold is growing in favor. It has been applied in that way at Mount Morgan, Australia, with brilliant success, for some years. Such open-vat lixiviation with chlorine-water is also being used at Goldfield, Nevada. There are no other solvents available at moderate prices to which gold is as sensitive as to these.

Zinc is less efficient as a precipitant than a zinc-couple with some other metal such as lead. In practice such a couple is made by immersing the freshly cut zinc-thread in a solution of 10% of acetate of lead. Agitation in the solution results in a chemical interchange, zinc acetate passing into solution, and lead being precipitated as a film on the zinc-thread. A great objection to this method is the large percentage of lead remaining in the gold precipitates, this being often as high as 20%. Where the precipitates are cleaned up by fusion with litharge and cupelling, such an objection does not apply.

The steam siphon is the simplest of all pumps, since it has no movable parts. It consists of a vertical discharge-pipe, open at both ends, through the side of which enters a smaller pipe having its end bent up. The lower end of the discharge-pipe dips into water, and the small pipe is connected to the steam boiler. The steam, on issuing from the small pipe, carries with it the air in the upper end of the discharge-pipe, tending to create a vacuum in the lower end of the pipe; the water then rises in the discharge pipe and is carried out with the steam. The steam siphon is limited to lifting water a few feet only.

Gold precipitate, often called zinc-slime, is more commonly cleaned and reduced to gold bullion by roasting and melting than by treatment with sulphuric acid. For a time the sulphuric acid method was the more popular, but there is a noticeable return to the older treatment. By careful roasting there is little loss by dusting, and none that can be proved by volatilization. The slime, from which part of the zinc has been eliminated by roasting, is melted with fluxes, enough sodium nitrate (ordinary commercial 'nitre') being added to oxidize the remaining zinc and other metallic impurities.

Deputy mineral surveyors are disqualified from making surveys of mining claims in which they have any interest. Aside from this there is no restriction which could possibly preclude their right to make a survey, valid for patent, of claims belonging to a company for which they were working on a salary. The distinction between the character of their relationship involved through the employment being temporary or permanent has no importance. It is conceivable that a corporation might have interests sufficient to maintain a deputy mineral surveyor on such work for an indefinite period, and might engage his entire time and pay him a monthly salary; any discrimination between such an engagement and another in which the surveyor's time was not unremittingly employed in surveying for patent would have no force. But any interest, direct or contingent in the property, would alter the case at once.

The hectograph is a convenient cheap device for reproducing reading matter or diagrams. It may be made and used as follows: soak 6 oz. of 'carpenter's white' glue in 8 oz. of water for about 12 hours; then slowly heat the mixture, to which 20 oz. of glycerine has been added, until all the glue is dissolved and the whole is of an even consistence. Do not let the mixture boil. Pour into a shallow rectangular tin pan, say 10 by 14 in. by 1½ in. deep, and when cool the hectograph is complete. Prepare the copy for the sheet to be reproduced on a good paper using special hectograph-ink, which may be purchased from dealers in stationery. A substitute may be made by dissolving in water the lead of an indelible pencil. Special hectograph ribbons may be procured and type-written copy prepared. Place the copy on the hectograph, face down, being sure that it is in intimate contact in all places. Allow it to remain several minutes, in order that the ink may penetrate into the pad. Remove the copy and replace it with a clean sheet of paper, which when removed will show an exact duplicate of the original. Among the advantages of this scheme is the fact that different colors may be reproduced together, and that diagrams and reading matter may be made on the same sheet. From 50 to 100 copies may be made from one original. The hectograph should be washed thoroughly after using, preferably with lukewarm water, and when dry is ready for use again. The pad should be re-melted occasionally.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Standardization of Mine Accounts.

The Editor:

Sir—At a time when the standardization of mining terms and accounts is occupying so much attention, the expression of individual opinions should be encouraged. The subject is of such general interest that a public discussion providing the means of exposition and enlightenment of ideas, would, I take it, be welcomed by those to whom the final arbitration of this question should be left. The difficulties in the way of securing the general acceptance of any plan of standardization are no less manifest than the advantages obtainable, and both points have from time to time been ably dealt with by engineers and others. It is with a view, however, to promote a discussion on the broad aspects of the case that the following notes are submitted. Considering the advantages first; one of the greatest benefits to be secured would seem to be the harmonizing of ideas, tending to unity of purpose between a mine manager and the board of directors. The language of mining and the language of finance have grown independently of one another, and small wonder, for there has been no dictionary of the one and much license in the other. The suggestion of a manager harassed by technicalities which he cannot share because he cannot adequately translate them, will not be unfamiliar. Such an one may well experience a harrowing sense of unimportance when next he sees his yearly report, which, complete with analyzed accounts of departmental costs, he has laid upon the altar of finance; he may even feel envious of the dominance in the balance-sheet of such high titles as capital, depreciation, property, premium on shares accounts, and their kin, which he himself has never fathered. I have even known a manager who had to ask his book-keeper for information regarding his own work because he had not a month to spare in which to disentangle the requisite data. Such things do not tend to harmony, and it is possible that a like want of appreciation of the relative merits of financial and operating accounts is also to be found among shareholders. The fault is with ourselves. If the several operating mine-accounts had just as definite a meaning as 'property accounts' and rather more than 'depreciation,' financiers would clamor for their universal adoption. Shareholders might even be trusted with them.

Perhaps one of the greatest obstacles in the way of standardization of mine accounts is to be found in the natural disinclination of the authors of many excellent systems to admit the want of anything better. Such systems have perhaps been fashioned to meet certain requirements and undoubtedly 'fill the bill,' or they may be the result of long and varied experience, and be capable of more or less universal usage. The arrangement, however, may be based on certain views of the distribution of minor accounts, and these views may be correct. It is not beyond the bounds of possibility, though, that such correctness does not imply universality of opinion, and so A's system, which is excellent, and B's system, which is better in B's opinion, may by their very perfections apparently militate against any course which might make operating-accounts other than the nondescript things the average shareholder thinks them. The question arises, cannot the main objects of standardization be attained without treading on the toes of A and B? It may be granted that all mining-undertakings have certain objects in common, attained by many different ways and means. It is suggested that the common aims may be so described as to be capable of being represented each by its separate account, which accounts may form the basis of standardization, while ways and means may be provided for by secondary accounts, which may be divided and subdivided to meet individual needs and views as required, but are all finally apportionable between the accounts for the common object achieved. For example, it will be conceded that three purposes which are common to all mining undertakings are: (1) finding ore; (2) extracting it; and (3) treating it.

Take the first two headings and consider them in connection with three sets of conditions:

(a) Where diamond drilling, as in South Africa, goes far toward establishing the existence of ore-bodies, to open up and work which, extensive hoisting plant is so far necessary as to form a predominating feature of cost.

(b) Where, as in Nevada or in Mexico, for instance, sinking through an overlying formation is a first step in the process of finding ore.

(c) Where, as in the higher altitudes of the Sierra Nevada, water is scarce, the workings are approached by adits, but hoisting in a shaft is still resorted to, and pumping is partly or wholly for the benefit of treatment.

Hoisting and pumping will evidently acquire very different values in connection with the finding or extracting of ore under these different conditions, or conceivably at different times under the same conditions. Were *a* a universal condition of mining, there might be an excuse for calling hoisting a main-account, but evidently the importance of hoisting as a factor in mining is variable, and again in the case of *b* it is the extra difficulty attending development that has to be emphasized by the cost of hoisting in the first instance, whereas if such cost be relegated at first to a hoisting-account, and left there, this lesson is lost. In case *c*, pumping may possibly be no necessary adjunct to either finding or extracting ore, whereas at one period or another, in case *a*, pumping might be wholly necessary to the first process. It may be said that, from an engineering point of view, at this rate it would be of little use to standardize accounts, if it is to be held that, for example, extracting ore itself is at one time to include pumping, hoisting, and tramming some miles perhaps, and at another time that it means just breaking rock and putting it in a chute. The answer to this is, I think, that two objects are to be gained by standardization,

from an engineering point of view. First, the possibility of comparing methods in different localities. Second, the possibility of comparing costs under similar conditions. The first object infers a variety of methods, to compare which a basis is necessary. Such a basis of comparison would most suitably be the purposes aimed at which are common to all cases. The second object implies a knowledge of conditions, and this knowledge throws the necessary light upon the meaning of the accounts employed.

A definition of a primary operation then would be: a distinct step in the course of finding, extracting, or treating ore, which is not for the benefit of a subsequent step or steps, except in so far as finding leads to extracting, and the latter to treatment. If this definition be adhered to it seems that the number of possible primary accounts are actually limited to: (1) development, (2) stoping, (3) ore transportation, (4) any one or more treatment processes, such as amalgamation, concentration, cyanidation, smelting, refining, etc.; to which may be added: (5) administration, (6) mine equipment, (7) maintenance. This list of accounts must include all expenditure.

Next to be considered are the secondary accounts for ways and means, examples of which are: stoping, development, hoisting, pumping, crushing, re-grinding, power, shop, assay-office, office-expense, foremen, traveling-expense. In further explanation of the views taken, a comparison of two methods of treatment may be considered. Let us assume that there are two plants, one of which treats its ore by stamp-milling, amalgamation, concentrating, and cyaniding, the other by concentration alone; certainly the total cost of treatment is not to be compared in each case, except in the way of comparing methods; neither is the cost of concentration to be compared, if in the one case Frue vanners alone are used, and in the other case there is a complicated treatment by crushers, rolls, trommels, jigs, screens, classifiers, Wilfley tables, etc., except on the understanding that in one case it represents the whole cost of treatment, whereas in the other it forms but one step toward this end. With a knowledge of the conditions, however, these concentrating costs are always available for comparison. In the same way, three distinct treatment-processes are benefited by crushing in the first instance cited, whereas in the second case the ore is crushed for the purpose of concentration alone. The fact is, as before stated, that one does not wish to make general comparisons of costs without a knowledge of conditions, and if each primary account for treatment is understood to begin and end with certain stages, the object of standardization can be better served by a broad classification than otherwise, while individual requirements may be taken care of in as much detail as conditions warrant by the series of secondary apportionable accounts.

This last stipulation brings us to a consideration of the meaning to be allotted to, and the delimitation of the functions of, the several accounts, whether primary or secondary. The following definitions are submitted: Mine development; primarily this term should be held to imply all steps in connection with the creation of reserves. Unfortunately, however, there are instances known to all of us where work, with this worthy object in view, has failed in its achievement; consequently the definition must be broadened to the extent of including prospecting. Instances are not unknown where what might be termed haphazard cross-cutting is profitable, some of the work being productive of results, and some not. In such a case the whole cost would be charged to development. In other instances the possession of large concessions warrants a policy of prospecting pure and simple, independently of the working of the main property. In this case a subdivision of the mine-development account into prospecting and development proper might be necessary. The fact remains, however, that all such work, whether prospecting or not, is carried out with the object of finding ore. It is therefore meant to be development, and as such should be charged. Development, as all other main-accounts, includes expenditure directly chargeable, and apportionments of some secondary accounts, as hoisting, pumping, power, and foremen. The costs directly chargeable will include everything necessary to the carrying on of the work at the time, that is to say, all labor and supplies necessary for the breaking of ground, and equipment necessary for continuing to break ground with the object of finding ore. The costs chargeable to development continue until the next step is initiated. This step is stoping development. There will probably be differences of opinion as to whether this account should be called a main-account or not. The opinion held is that it is exclusively for the benefit of stoping, and that no useful purpose would be served by introducing such a term into the list of main-accounts. It is no less capable of definite explanation, however, and should include all work done in preparation for stoping established orebodies, including preliminary provisions for ventilation in working the stope, and for handling the broken ore. This account is also chargeable with an apportionment of power, hoisting, and foremen. Stoping will include the expense attached to breaking rock in established stopes, including sorting and handling of waste found in the stope, whether such sorting be done underground or on the surface, delivering ore to the surface through shaft or tunnel, delivering waste similarly or using it as filling, breaking waste rock for the purpose of filling worked-out stopes, and all other expenses attendant upon the continuation of stoping work, such as timbering, apportionments of hoisting, pumping, power, and foremen.

Ore transportation is to be treated from the mine depository to that point where the first step in ore-treatment, or for the benefit of treatment, is taken, with apportionments of power and foremen. Crushing includes breaking and crushing in crushers, stamp-batteries, rolls or mills, until the first step in reduction or treatment commences, with apportionments of power and foremen. Treatment processes, besides including apportionments of crushing, power, shop, and foremen, will include all expense attendant

upon driven-machinery, and regular 'wear and tear.' Mine equipment will include nothing but repairs to previously finished work, as re-timbering, re-laying of track, secondary equipment of shafts, repairs to chutes, etc., and may include apportionments of hoisting, pumping, and foremen. Maintenance will include expenses for repairs to existing surface works, buildings, and plant, in exactly the same way that mine equipment refers to underground works. Administration will include all fees and salaries in respect of head-office expenditure, salaries of manager, superintendents, assistants, assayers, and surveyors, the whole office, assaying, surveying, legal, and traveling-expense. Power generation and transmission to departmental line-shafts or users being in one account, for example, cost of fuel, engineers, firemen, construction and up-keep of flumes, ditches, dams, electric-transmission lines, etc., including labor and supplies. Shop includes carpenters', blacksmiths', and mechanics' shop-expenses. Nearly all work done can be charged direct to primary accounts, but the running of shop machinery and upkeep of tools, and the salaries of the outside foremen and his officials, should be included in this account, apportioned monthly according to work done. All assay-office expenses are chargeable to administration. This account will not include retorting and smelting, which is often performed by the assayer, but will refer only to labor and supplies in connection with assaying proper. The contention is that assaying is done merely as a guide to technical direction. Office-expense is primarily to include all clerical work. The foremen account will include the supervision of mining operations, including the salaries of foremen and all officials directly under their orders, such as time-keepers, mine-store keeper, and shift bosses. Mine hoisting and pumping will naturally be charged with their apportionment of power used.

The adoption of such self-explanatory denominations and generalization would, it is contended, go far toward removing the objections that now exist in the minds of many accountants to the charging of all expenditure direct to working-costs. Let it be once understood that the business of a mining company has to do with expenditure and profits arising from operations in half a dozen or more well-defined channels or departments, and each of these departments will acquire a concrete value in the minds of financiers. Such channels are shown in the primary accounts. The inclusion of a general expense account is an admission of inefficiency. Let such an account be left to those who are interested in obscuring main issues. I take the stand, then, that all current operating expenses can be included in one or other of a hard and fast series of accounts. It now behooves us to step gently as we approach the domain of special expenditures. Keeping in view the ever-recurring question, what is the ultimate object for which expense is incurred, let us consider what is the essential difference between expenditures, thus far considered, and special expenditures. It is suggested that this difference may be summed up as follows: current expenses are for the benefit of the immediate period of time, and are such as are necessary for the carrying on of work during that period. Special expenditure is for the benefit of a greater period of time, whether of the immediate as well as future periods, or of a future period alone. This difference need be no bar to the treatment of special expenses in the same way as current expenses. There is one other subdivision of special expenses, however, namely, expenditure provided for out of revenue, and expenditure provided for out of specially raised funds. Again, we see no reason why the ultimate object of special expenditures need be obscured. It may be taken as an axiom that no work will be put in hand unless for a concomitant advantage, or until it is needed. Capital has to be sunk for the undertaking, and whether this capital be set aside out of revenue or borrowed from an outside source, the work undertaken must be charged with the cost of the loss of its earning power. The advantage referred to must be more or less clearly defined in the minds of those responsible for the undertaking, and the period of time requisite for the amortization of the outlay by profits accruing is a matter of calculation. Hence we arrive at the conclusion that all special accounts are to stand charged with interest on the money provided for them. The rest is simple; a suspense account is used, the special expenditure is charged to it with interest, and monthly apportionments are written off to the primary account or accounts benefiting throughout the period of time decided upon. All special expenditures may be gathered together and referred to a general suspense account, which may be called a 'floating general account,' and which will show at a glance the total amount sunk in special accounts, and the amount still outstanding and chargeable to the primary operating accounts.

'Property account' now remains out of all the capital accounts. Let it include the purchase of mineral claims alone and give it a three-year life. The principle of development-redemption is of course sound, but need not interfere with a general scheme as outlined in the above suggestions. The limitations of this paper are acutely felt. The omission of all reference to conditions applying to placer-mining, dredging, etc., and the handling of stores and mine-supplies, is intentional, but indulgence is craved for many other instances in which the details of working in connection with the carrying into effect of suggestions briefly made, would appear to be ignored. The remark regarding property-account is a glaring instance. The scope of the ambition which I entertain is that in the standardization of mining accounts, which will surely be carried into effect, the principle of ultimate reduction to a few main accounts for common objects achieved, will find a place, to the end that such accounts may be universally adopted in balance-sheets.

HORACE G. NICHOLS.

Ymir, B. C., June 29.

Conical-Bottom Tanks.

The Editor:

Sir—In your issue of July 25, Walter Neal asks the question: "Why not build flat-bottom tanks and

allow the slime to form its own cone, instead of building conical-bottom tanks for slime treatment?'' For the reason brought out later in the article by Mr. Neal, namely, that the slime forms too steep a cone, it is not practical. It is, however, practical to use the settled slime for the support of a false conical bottom inside the flat-bottomed tank, and the difficulties of construction are thereby obviated. At the plant with which I was for several years connected, the following method of construction is used for both settling-cones and conical-bottom agitation-tanks. First a perfectly tight, flat-bottom tank is built, and inside this a false conical bottom is placed. This false bottom is roughly built, and no effort is made to make it tight. On filling the tank the pulp flows under as well as above the wooden cone, so it requires very little support. After draining the tank a few times the slime settles and packs between the false and real tank-bottoms, making a perfect and permanent support for the wooden cone.

SUMNER E. BROWN.

San Francisco, August 1.

Electric Versus Compressed-Air Transmission.

The Editor:

Sir—Referring to an article entitled 'Underground Air-Compressors', in your issue of August 1, I wish to point out what I consider to be some misleading statements. To quote from the article: ''The underground compressor, taking electric power at practically the same potential as a compressor at the surface, had the advantage of saving, first of all, the capital-cost of the pipe-lines, and was thus able to generate compressed-air at a lower pressure...'' (because of the loss of pressure due to transmission in the pipe-lines). This statement would lead one to suppose that an electric transmission-line costs practically nothing compared to the cost of one for transmitting the same power in the form of compressed air. This is not by any means the first time I have seen this asserted, and never have I seen it contradicted.

As a matter of fact, judging from my own experience, the electric transmission-line will cost more, in most mines, than that for transmitting air. This may not be the case on the surface, where electricity can be transmitted at a high potential over small bare wires carried on poles, while the air-pipe lines have to be buried, but underground-conditions in most mines are quite different. If an electric transmission line is expected to be permanent in a wet mine, especially when there is acid in the water, all conductors must be in the form of lead-covered cables, and these cables must be further protected from mechanical injury by either steel or wooden armor. This I have learned by sad experience to be true, even when the current is carried at a low voltage. Underground rubber-covered wires carried on glass insulators will, after a while, leak as much power as a very poorly constructed air-line, and the wires will break wherever they come under a drip. At the mine with which I am at present connected there is an installation of electric and air-driven pumps, side by side, of about the same capacity affording an excellent opportunity for comparison in the costs of their respective transmission-lines, 1600 ft. down a vertical shaft. The cost of the cable to supply the current to the electric pumps was some three hundred dollars more than the cost of the pipe supplying air to the compressed-air pumps. It has been stated that the cost of putting in air-pipe is greater than that of electric wiring. This also is sometimes not true, depending very much on circumstances. In the installation to which I have just referred, putting in the electric cable probably cost the most, but an exact account was not kept. An expert had to be obtained from San Francisco to do the splicing. As this could not be done either vertically or in a wet place, the cable had to be spliced before lowering down the shaft. As it was not strong enough to support its own weight, it was necessary to lash it at intervals to a wire cable as it was lowered, and afterward to cut it loose from the cable and clamp it to the shaft timbers. Unforeseen difficulties, such as the two cables becoming twisted around each other, and the fact that the hoisting engine was not strong enough to support the total weight, made the operation anything but as simple as it would seem. Now that they are both in place, if anything happens to the air-line, any miner can replace a length of pipe, but if something should get loose on a cage and rip out a piece of the cable, the consequences might be disastrous and expensive, carrying, as it does, current at 1000 volt. Many people would consider 1000 volt too high a potential for safety in a mine, and if this were reduced to 500 volt, the cable would have cost twice as much as it did.

To take up the question of loss of power in transmission; electric and air-transmission lines should be calculated in exactly the same way, that is, the size of the conductor or pipe should be in either case such that an increase in size would not save enough power to pay the interest on the added investment. Therefore, if the cost of the transmission-lines were the same in the two cases, the loss in power-transmission would be the same. As a matter of fact, it is too often the case that the superintendent or foreman 'guesses' that 'a four-inch line will carry it' in the case of an air-pipe, but when it comes to an electric line, about which there is something mysterious to many people, the services of an electrician are called in, and he figures the size by formula. But this state of things does not change the facts, that the loss of power in transmission should be no more in the case of compressed-air than in that of electricity, and that it costs about as much for electric-cables as it does for air-pipes. I might add that a poorly constructed electric-line will leak power as well as a poorly constructed air-line.

ARTHUR B. FOOTE.

Grass Valley, Cal., August 3.

Willow snow fences are to be tried on the Northern Pacific railway the coming winter in North Dakota. The railway plans to set out about 100,000 golden willow in the belief that they will serve better than the inflamable board snow-fences now used.

THE BLOWING-DOWN SYSTEM OF SLUICING.

By James Park.

*This is a novel system of sluicing that has been successfully used for the working of wide stretches of poor alluvial ground in central Otago. Its greatest application has been in the Cromwell district, where it has been in use for over thirty years. It was first introduced by a Russian miner, and, although so long in use, is almost unknown outside of central Otago. This system can only be applied to the working of alluvial ground under the following conditions: (a) where the wash lies on a sloping bottom, having a gradient of not less than 1 in 3; (b) where the wash is shallow, that is to say, not exceeding 6 ft.; and (c) where large stones are absent, that is, stones not too large for two men to handle. In ordinary sluicing, whether 'ground-sluicing' or hydrauli-

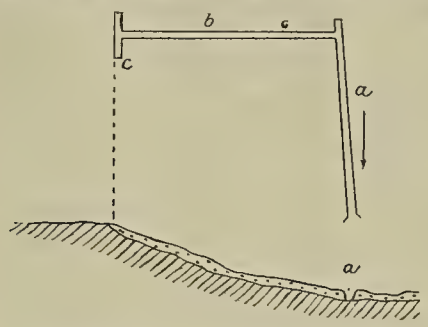


Fig. 1. Plan and Profile of Gravel Wash on Sloping Ground.

cking, the practice is to begin operations at the lowest part of the ground, and to work forward on the rising bottom, the main tail-race being extended as the working-face recedes. This is 'working away from home.'

In the blowing-down system the main tail-race is carried to the boundary of the ground before the sluicing is started. After the tail-race is constructed a side-race or gutter of smaller dimensions is carried along the boundary. Two strips of ground about 3 yd. wide, one on each side, are now sluiced into the gutter, beginning at the top of the slope. This is 'working home.' When the strips on each side of the gutter reach within a yard or two of the main tail-race, another gutter is carried up the slope parallel to the first, and the sluicing operation is repeated, and so on, the ground being cut away in parallel slices. Let the accompanying Fig. 1 represent the plan and profile of a piece of alluvial ground, and let the natural drainage of the land be in the direction shown by the arrow.

In the above figure, (a) is the main tail-race, (b) the side gutter, and (c) the cross-trench where the sluicing begins. The trench (c) is cut out the full width of the paddock or strip to be washed down. It need not be cut down the full depth of the wash, as the water soon excavates it to the bottom. It is merely the starting-point of the operations. The stones are thrown back and stacked on the sluiced ground as the work proceeds. The water is brought to the top part of the ground in pipes, which are extended from time to time as the ground is cut away. It is conveyed from the pipe-line to the working-face in a stout canvas pipe 7 in. diam., and provided with a nozzle at the end. The nozzle is held in the hand or rests on a movable tripod. The canvas pipe is made in convenient lengths of 18 or 20 ft. As the face recedes fresh lengths are put on, being simply telescoped into each other for two or three feet. The joint thus made becomes quite tight when the water is turned on. In some cases two paddocks are washed down at the same time, and it is claimed that this system effects a considerable saving of time, as when one gutter becomes choked with stones, sluicing can be carried on in the other. The work thus goes on continuously in one paddock or the other. In this system of working there is practically no shoveling or forking, the only manual labor in-

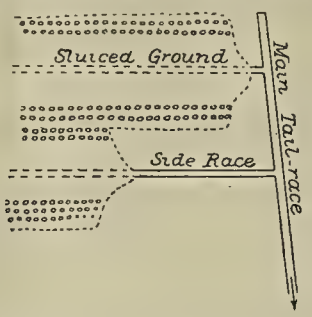


Fig. 2. Blowing-down System of Sluicing.

volved being the stacking of the stones. Alluvial miners claim that when the jet of water is directed downhill the cleaning-up of the bottom is much more effective than when it is directed upward, as it is in ordinary hydraulicking. In the latter case the tendency of the jet is to drive the particles of gold into crevices, where they cannot be dislodged without breaking up the bottom. The canvas used is 24 in. wide, sold in bolts containing about 42 yd. With a lap of 1¼ in., this width gives a hose about 7 in. diam. Two experienced miners, without assistance, sluiced away 10 acres of wash in two years. This is equal to 2½ acres per man per year. The depth of the wash varied from nothing to 5 ft., the average being 2 ft. 6 in. The blowing-down system is admirably adapted for the working of poor shallow ground that happens to rest on a bottom having the requisite slope to enable the water to carry the dirt down the side gutters into the main tail-race, where the gold is caught. It should be mentioned that it is sometimes found to be advantageous to allow a supplementary supply of water to run down the main tail-race, in order to keep it clear of debris. Further, the greater the pressure of water at the nozzle the quicker will the ground be sluiced away.

A mine may be over-ventilated until the air current has such a velocity that it stirs up dust, which in a metal mine makes the workings unhealthy, and in coal mines disseminates dust which may cause serious explosions.

* Abstracted from 'The Geology of Cromwell Subdivision,' Bulletin No. 5, New Zealand Geological Survey.

RECENT DEVELOPMENTS IN GOLD DREDGING

Written for the MINING AND SCIENTIFIC PRESS
By FRANK W. GRIFFIN.

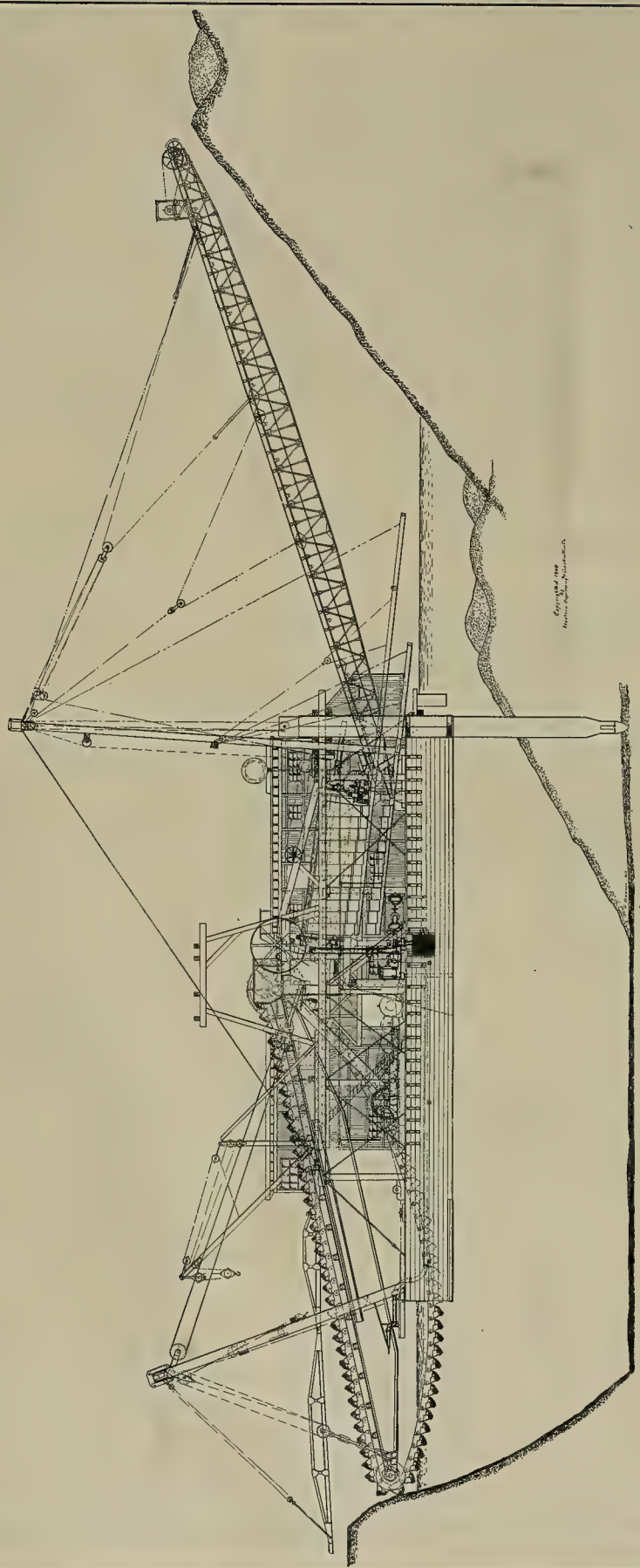
Although the progress made in gold dredging during the past few years has not seemed striking to the casual observer, nevertheless the results achieved are more far-reaching and solid than were those attained in the earlier days of dredging for gold. There has been no radical change in the design of the dredge itself, which is now an effective, well-balanced, reliable machine. Progress has taken place in a general improvement in essential mechanical details, together with important modifications of the gold-saving appliances. The work still to be done lies in progress along the same line of perfection of detail; for now, while most of the big parts, which long absorbed attention, are satisfactory, the effectiveness of these larger factors is still dependent upon the smaller ones. The capacity of any given dredge, and the resultant operating cost per cubic yard, is governed by the number of hours per day throughout the year that the dredge is actually digging gravel.

Great advantage has been gained by the use of special steels in the hard working and wearing-parts. The bucket-line, the most expensive wearing-part of a dredge, has been so improved by the introduction of chrome, nickel, and other special steels, that, even in the hardest digging, the bucket-bottoms will last for two and a half years. The hood of the bucket has been changed from a three-piece riveted affair to a single-piece part. This hood is made of cast-steel or cast-malleable iron with projecting rim for the bucket-lip to rest on, or of pressed-steel. The cast hood is strong, but is expensive. It is hard to fit, and excessively heavy in the larger buckets; consequently the pressed hood is generally used. An elaborate trial of the 'three-eye' (or three bearings for the pin) bucket has been made during the past two years, but it has not proved a marked success. Personally, I do not advocate the use of the 'three-eye' bucket, for two principal reasons: first, on account of the excessive strain put on the third eye, which causes the bucket to fail at this point when the pin wears; second, the change which is necessary in the upper tumbler greatly reduces the bearing-surface of the tumbler on the bucket-bottom, and further complicates the serious problem of the upper-tumbler wear.

More attention has been given to the gold-saving function of the dredge, with good results. Gravel hard to wash is most effectively treated by the revolving screen. Both the diameter and the length of the screen has been increased, and a greater amount of water, under higher pressure, is used. Small nozzles have been tried along the spray-pipe, but they are easily broken off, and are not of much practical benefit. An auxiliary force-pump, with a discharge at high pressure through two or three nozzles, independent of the main spray-pipe, would materially aid in the washing of 'sticky' gravel. The gold saving has always been good on a dredge, although the table-area is limited by the size of the hull, but it became a more serious problem as the capacity of the dredges kept constantly increasing, with no proportionate increase in the size of the hull. To meet this question, a double bank of tables was devised. In former practice, the fine material which passed through the screen was treated by one of two methods. First, the material dropped into a steel distributor under the screen, and was fed onto tables running at right angles to the distributor. These tables discharged into a tail-sluice, which carried the material off the stern of the dredge. Second, the material dropped into a steel tray, sloping in the same direction as the screen toward the stern. This tray discharged into another tray sloping in an opposite direction, which carried the screening back toward the bow, and emptied into launders, which distributed the material over a series of tables, which ran toward the stern. The effective table-area was limited by the height of the lower end of the screen from the deck.

A development of this second method led to the double-bank of tables, in order to get more gold-saving area. The first tray was changed so that the material from the upper screen was made to discharge directly upon a set of tables built immediately over the original set. These tables did not extend quite to the stern, but discharged over an inclined chute to the lower end of the lower tables. A further evolution of this idea led to a return to tables similar to those described under the first method, that is, the screening passed into a distributor, which extended the length of the screen, and from the distributor upon tables which ran at right angles to the screen. At the upper end of these tables, slots were cut and provided with adjustable plates, so that as much material as desired could be fed through pipes down to a second set of tables, which ran parallel to the first set, and about 4½ in. below them. These tables discharged into separate tail-sluices, one for each bank, running astern, one over the other, one being about 7 ft. higher than the other at the point of final discharge. The upper tail-sluice extends some 15 ft. farther aft than the lower. By this means the fines are carried farther back from the dredge, and are so well distributed that the sand-pump is entirely done away with.

The trend of development has been toward larger dredges, of greatly increased capacities. By this development, and also by the close attention which has been given to details in the smaller machines, the cost per yard of dredging has been materially reduced. When the dredge reached an assured capacity of one million cubic yards per year, and the cost approximated five cents per yard, it seemed that a standard had been set. It was felt that this was near to the economical limit of yardage, when the gold-saving as well as the digging was considered. But it soon became apparent that the larger and heavier the machines were, the easier they would dig hard compact gravel at less cost per yard. Then, with these larger dredges it was proved that ground which had been considered undredgable, either on account of hardness or on account of very low gold content, could be worked at a profit. Dredges with



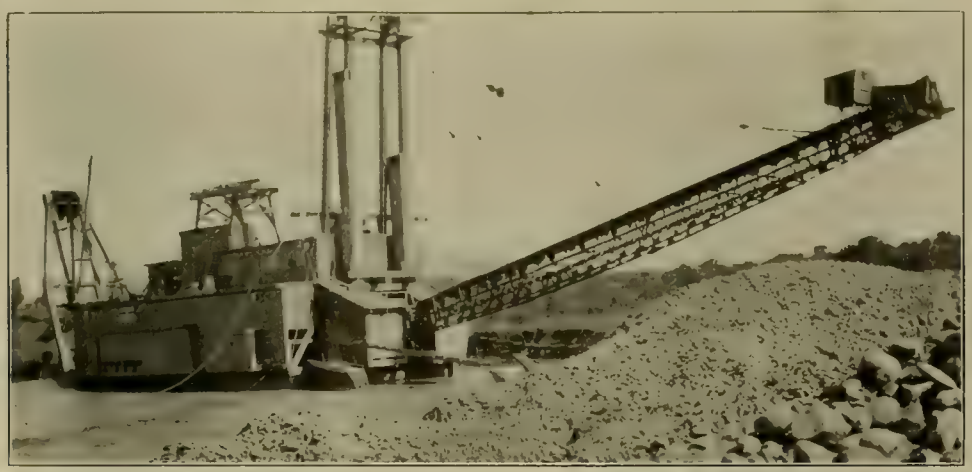
SIDE ELEVATION OF FOLSOM DEVELOPMENT CO.'S DREDGE NO. 6.

8½ Cubic Foot Buckets, and Double-Bank of Gold-Saving Tables.

Western Engineering & Construction Co.

close-connected buckets of 8 cu. ft. are now being successfully operated on the hardest ground known in dredging practice. There are also two dredges with close-connected buckets of 13 cubic feet.

The Folsom field offers a most interesting example of the progress and development of gold dredging, both with regard to the construction of the dredge and to the character of the material handled. There are two distinct channels at Folsom. The gravel of one is clean 'wash,' remarkably easy to dredge and to treat, as there is no clay and little sand. On the other channel, the gravel is harder than any that a dredge has ever been used upon. The deposit is deep, averaging, on Rebel hill, from 60 to 75 ft. It is practically cemented for the first six or eight feet, and is very compact for 25 to 30 ft. The lower strata of the gravel bed are looser, and do not present any great difficulties in dredging. In common with many who examined this Rebel Hill channel, I felt that it could not be dredged except at excessive cost, and not at all without constant blasting. The problem which this ground presented was unparalleled in gold dredging. To dig gravel of such character a dredge of exceptional strength had to be designed. If the depth had been 30 ft., the question would have been serious enough, but to build a dredge with buckets of 8.5 cu. ft. capacity to dig to a depth of 70 ft., with all the excessive weight of machinery that would follow the carrying out of such a design, seemed an almost impracticable task. It was R. G. Hanford, general manager for the Folsom Development Co., who conceived the idea of using monitors to break down the first 25 or 30 ft. of ground, and by this process only the remaining 35 ft. would have to be dug. As the water-level of the pit would be 20 ft. below the surface of the ground, some means of disposing of the tailing had to be devised. It was thought this could be accomplished by building a very long stacker and by using two extraordinarily large sand-pumps. So the dredge Folsom No. 5 was built. The hull was 110 ft. long by 44 ft. 6 in. wide, by 10 ft. deep. It was specially designed to stand the heaviest digging-strains. The machinery was made almost excessively heavy. The ladder was long enough to dig to a depth of 35 ft. below the water-level, while the buckets were 8.5 cu. ft., with 6-in. pins. The stacker, a 40-in. belt-conveyor, was 138 ft. long. Two monitors with 3-in. nozzles were placed on the bow of the dredge, on both starboard and port sides of the well-hole. The monitors were supplied with water from a high-head centrifugal pump, driven by a 100-hp. motor. The dredge started to work in December, 1905. The results of the operations were most interesting. The monitors were a success, and broke down the bank, by undermining it near the water-level, without difficulty. The ground below water-level did not prove as hard as that above, and the heavy dredge handled it with comparative ease. However, the sand-pumps were a failure, and, as the operations of the dredge were



Folsom Dredge No. 6. Showing Tail-Sluices from Double-bank of Gold-Saving Tables.

Monitor Breaking Down Bank for Dredging.

entirely dependent upon them, serious complications developed. These difficulties were gradually overcome by lengthening the digging-ladder 15 ft., and by using the double-bank of tables, a feature first developed on this boat. This dredge pointed the way to a solution of the problem of digging successfully and economically the hard deep gravel of Rebel hill. This solution was achieved by dredge No. 6 of the Folsom Development Co., which began to dig gravel in March, 1908. No expense was spared to make it as effective a dredge as possible. The experience acquired in working No. 5 dredge led to a more highly satisfactory machine that is handling about 150,000 cu. yd. of gravel per month, at a cost of approximately 4½c. per cubic yard. A general description of this dredge is as follows:

Length of hull	120 ft.
Width of hull, on water-line	46 ft. 6 in.
Depth of hull	10 ft. 3 in.
Digging-depth below water-level at 45°	48 ft.
Size of buckets	8.5 cu. ft.
Number of buckets	86
Weight of buckets, each	3055 lb.
Weight of upper tumbler	20,000 lb.
Weight of lower tumbler	16,000 lb.
Weight of ladder and fittings	144,000 lb.
Dimensions of steel spud	54 by 34 in. by 75 ft. long
Weight of steel spud	76,000 lb.
Revolving screen	7 ft. diam., 36 ft. long
Weight of revolving screen	46,410 lb.

The total weight of machinery on the dredge is approximately one million pounds. In addition to this machinery-weight, the following partial list of material is used in the construction of the dredge:

	Lb.
Truss rods and plates	30,000
Iron and steel	30,000
Nuts, bolts, and nails	33,000
Piping and valves	24,000

The total weight on the dredge exceeds 1,250,000 lb., while 370,000 ft. of lumber was used in the hull. The motor equipment of the dredge aggregates 560 hp., distributed as follows:

	Hp.
Main digging	200
Main pump	100
Secondary pump	50
Winch, variable speed	30
Screen, variable speed	30
Stacker, variable speed	50
Monitors, two 50-hp.	100

All motors 50 hp. and over take current at 2200 volt, and all motors under 50 hp. at 440 volt. The pumps used are: main pump, one 12-in., 60-ft. head, centrifugal, direct-connected to 100-hp. motor; secondary pump, one 12-in., 30-ft. head, centrifugal, direct-connected to 50-hp. motor; pump for monitors, one 8-in. two-step, 150-ft. head, centrifugal, direct-connected to two 50-hp. motors.

The tables are of steel, of the double-bank type of construction. The tail-sluices are 4 ft. wide. The stacker is a 38-in. belt-conveyor, 142-ft. centres. Unfortunately the buckets are of the three-eye type, and are already causing wear on the upper-tumbler faces. This is a source of annoyance and delay, but is subject to correction. The main cause for delay in the operation of the dredge comes from the bow-swing-lines. This seemingly insignificant point is an illustration of what was mentioned earlier in this article, namely, that the work ahead of the dredge-designer lies in the perfection of details. I venture the assertion that the capacity of the dredge has been reduced 10,000 cu. yd. per month on account of time lost in the moving and replacing of these bow-lines. At the outset ⅞-in. lines were used. On account of the hard service, they lasted only a short time. They were replaced by 1⅛-in. lines, which are giving fair satisfaction, but they are very cumbersome to shift. In the case of this dredge the side-line trouble is increased on account of the high bank which is always around the dredge. The shore-sheave hangs over the side of the bank on a pendant, but it is not practicable to get a sheave large enough in diameter for the line. The reason for this is that there is always a bad up-and-down lead to the line, and consequently it chafes on the flange of the sheave and also on the rim. Then too, such a sheave would weigh so much that it would increase the difficulty of shifting the lines. The solution will probably be in devising a method to swing the boat by means of a single line, and thus eliminate the shore sheave.

The monitors at the bow of the dredge are fitted with 2-in. nozzles. The water is furnished to them by a special 150-ft. head centrifugal pump with 10-in. suction and 8-in. discharge. This pump is direct-connected to two 50-hp. motors. The two monitors are operated at the same time, and are in use about two-thirds of the day. Care has to be exercised so that too much of the bank is not broken down at one time, for in that event the 'cave' would either fall so far behind the bow of the dredge that the buckets could not pick up the gravel, or so much material would have to be handled by the dredge at one setting that it would ground at the stern. The dredge does not present any difficulty in handling the tight ground, while the washing in the large screen is excellent. The double bank of tables affords ample area for saving the gold, and the system of double tail-sluices does away with sand troubles. With the exception of the wear on the upper tumbler-plates and the swing-line problem, the dredge is eminently satisfactory. When these troubles are corrected, there would seem to be no reason why it should not maintain an average capacity of 150,000 cu. yd. per month.

The development of this dredge marks a distinct forward step, by demonstrating that ground which a few years ago could not have been dredged, can now be handled with profit. In marked contrast with this hard gravel is the other deposit at Folsom, which is being worked by the 'thirteen-foot' dredges. This gravel is easier to work than any other deposit I know of. About two years ago the Folsom Development Co. built its No. 4 dredge, with close-connected buckets of 13 cu. ft. capacity. This machine has handled a yardage of approximately 180,000 per month, at a cost of about 3c. per cubic yard. Using this dredge as a guide, the Natoma Development Co. installed a 13-ft. dredge on adjoining ground. The Natoma No. 1 began operation on May 7, 1908, and has made a most remarkable showing. An unusually large hull was built, both to

insure flotation and to provide for a large table-area. Extra large shaking-screens are used, as no revolving screen could handle the tremendous amount of gravel that the buckets dig. As the gravel is clean, and has only a small percentage of sand, it washes easily and runs freely over the tables, which are of the double-bank type and are most efficient. This

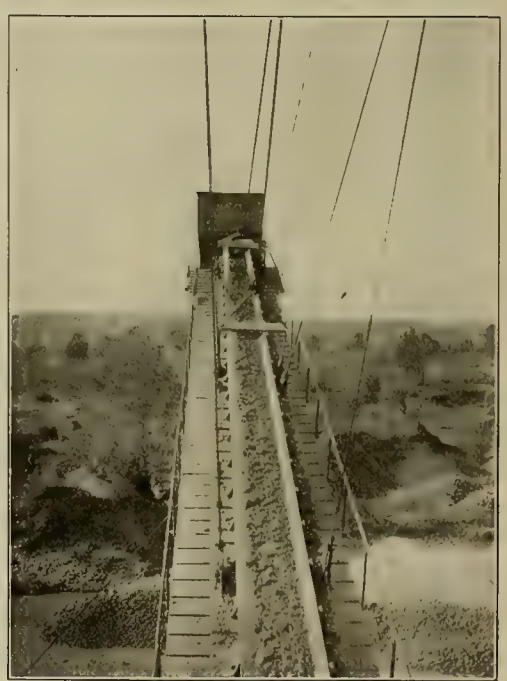
Lower Bank of Gold-Saving Tables on Folsom Dredge No. 6.

dredge has made the following average daily yardage:

	Cu. yd. per day.
May	8029
June	8200
July	8350

The power used has averaged 39,700 kw. hr. per week, and the cost has been considerably under 2½c. per cu. yd. The result obtained with this Natoma dredge is as striking as that of the Folsom No. 6 in illustrating the development of the dredge on ground of totally different character. Unquestionably a great amount of ground will be added to the dredging field, and many deposits that have been considered too low in value, or too hard to dredge, will bear re-investigation in the light of the results given by these two dredges.

The Silician sulphur industry, according to the *Financial Times* of London, is in a difficult situation because of excessive over-production, caused by a slackening in exports, for which there appears to be no immediate prospect of alleviation. Even the good will and assistance of the Government and the efforts of the Sulphur Association seem to have been powerless to avert what looks like a serious crisis threatening the industry. Advices from Palermo state that the glut has been so great that at the end of February stocks were estimated at 573,000 metric tons, and production continued at 450,000 tons, while exports were not more than 400,000 tons. The degree of congestion is shown by the fact that at two of the ports, Empedocle and Licata, there is absolutely no room for new warehouses or depots, while the stocks already held are enormous. The sale of sulphur at low rates for industrial purposes has been advocated, but this idea had to be abandoned, as not only difficult of control, but as contravening the agreement with the American industry. Another more likely scheme is to sell unrefined sulphur-ore abroad as a substitute for pyrite.



Robins Belt-Conveyor on Tailing-Stacker.

BALANCES.

Written for the MINING AND SCIENTIFIC PRESS
By A. AUSTIN and SWIFT HUNTER.

The principle underlying the ordinary chemical and assay-balance is that of a lever of the first class, with arms of equal length, the power and weight consisting of the force exerted by gravity on the masses carried in the pans. This lever when constructed in the form of a beam of a working balance must combine certain properties in order that it may possess the requisites for accurate weighing, namely, sensitiveness and stability of poise.

By referring to a text-book on physics we find, worked out on the principle of moments, formulas which show that, in a good balance, the knife-edges from which the scale-pans are suspended must be on an exact level with the fulcrum or centre-bearing of the beam. Also, letting L = length of the balance-beam, W = its weight, and D = the distance of the centre of gravity below the fulcrum, then it is shown that the deflection for a given load depends on the magnitude of the fraction $\frac{L}{WD}$.

In order that the balance may be very sensitive, namely, with a readable deflection on very small weights, this relation of L, W, and D must be considered. The relation of L to W is such that the apparent advantage of making L large is more than offset by the increase of W. Hence balance-makers are today constructing a beam that is short and very light.

The necessity for a value D is apparent, for the sensitiveness of a balance must go hand in hand with its stability of poise. Stability of poise implies rapidity of indication and to secure the latter it is necessary that the centre of gravity of the beam be some distance below the fulcrum. A large value tends to make the balance less sensitive, so that a value for D must be chosen to give a balance of fairly quick action, leaving it still sensitive enough for the work in hand. It follows that the lighter the beam the greater can the value D be for a given sensitiveness.

The lowering of the centre of gravity of the balance increases the friction on its bearings, and calls for extreme care in the construction of knife-edges that the sensibility be not destroyed. A good balance for smelter-laboratory work must be sensitive and stable, and yet quick acting. The beam, though light, must be rigid enough to bear the heaviest weights used on it. To facilitate weighing, a convenient beam and pan-rest are necessary. Control of the beam may be secured by the turn of an outside thumb-screw, one action disengaging beam and pans. Or the beam may be taken from its rest by the motion of one mechanism and the pans from theirs by a different one. The one-motion release is common on button balances, the latter on analytical types.

The balance should be equipped with a suitable pointer and a graduated arc to indicate its deflection. For weighing milligrams or fractions the beam is graduated, and a rider used in conjunction, which is moved back and forth by a shifter operated from without the case. Regulating-screws for changing the equilibrium and centre of gravity of the beam are required, also screw-rests for leveling the balance. The balance is usually surrounded by a glass case of a compact and convenient form to furnish suitable protection from air-draughts, dust, and fume. Finally, as installed, the balance should show the desired grade of sensitiveness by a movement of the pointer over one-half a division of the arc under the smallest weight. Stability should be evidenced by the tendency of the pointer to invariably re-assume its original position. Balances in use around a laboratory may be divided into two classes: analytical balances and button balances.

Analytical Balances.—The common balance of this type is capable of bearing a load of 70 to 80 gm. in each pan. The finer and more expensive grades have a rated sensitiveness of $^1/_{20}$ mg. Another common grade is rated as sensitive to $^1/_{10}$ mg. As a rule, those operators who are using the finer balances on ordinary laboratory work have adjusted the centre of gravity of the beam so as to decrease the rated sensitiveness with a view to quicker weighings. The balance as it then stands is very stable, and because of good construction is very accurate. Certain grades of analytical work do not require as sensitive a balance as the $^1/_{20}$ or $^1/_{10}$ mg. type. For instance, in weighing out pulp containing a small amount of the element sought, as in colorimetric copper-work, the balance need not be sensitive under 1 mg. One gram or more of sample is taken and the copper content is perhaps only 3 or 4 mg. The amount of material taken is an index of the sensitiveness required. An assay pulp-balance weighing assay-ton lots is rated as sensitive to ¼ or ½ mg. In actual use the balance is not weighing up to such a grade. An operator should keep in mind the closeness of weighing required to give the admissable error, and then keep well within the limit. In variance to a button balance, equality of arms need not be a requirement on an analytical balance. If there is a difference it can be compensated for by always weighing pulp and result on the same pan. When so weighing it is a question not of actual but of relative weight.

Button Balances.—A very sensitive balance is required for weighing gold and silver beads. The manufacturers of balances are constructing balances rated as sensitive to $^1/_{500}$ mg. in order to meet the demand for an accurate balance for weighing extremely small amounts of gold. Nowadays when gold is reported in thousandths of an ounce, such a balance is required. Of course, the weighing is made on two or more assay-tons, so that few gold-buttons are weighed below $^1/_{100}$ mg. A balance of the above grade will handle a maximum weight of 10 gm. Silver or silver-gold buttons do not require as sensitive a balance as the $^1/_{500}$ mg. type, nor, for that matter, does a reasonable sized gold-button, where a difference of a couple of hundredths of a milligram is allowable. The opening up of large deposits of copper-ores, with a very small gold content, has brought into prominence the demand for a balance of the $^1/_{500}$ mg. type. The gold-button from an assay-ton of such ore may be one or two hundredths

of a milligram in weight, and should be weighed very closely because of the large tonnage it may represent.

Other types of button-balances are rated as sensitive to $^1/_{400}$ mg. or $^1/_{200}$ mg., the lowest grade being $^1/_{100}$ mg. Portable assay-balances are usually sensitive to $^1/_{100}$ mg. The button-balance as now constructed is a very beautiful piece of work. The beam is rarely over 5 in. long, and is made of a strong, light material, such as aluminum or some of its alloys. It is non-magnetic, and has a low coefficient of expansion, to do away with temperature-changes. The material in hangers and other parts is in keeping. A very short column is used on the most sensitive balances and they are then known as the 'non-column' type. The short-column, by decreasing the length of the pan-hangers, tends to concentrate the movable mass near its central axis, giving great stability of poise. To compensate for the short-beam a long pointer is used which plainly indicates a small beam-movement. Reading glasses may assist in reading the pointer, or for determining the reading of the rider on the graduated beam. The non-column balance may have two different styles of pointer. One kind is upright, the graduated arc being at the top of the balance-case. The other kind is an extension of the beam, and is horizontal, the graduated arc being vertical. One make of balance has no graduations on the beam, but uses a special graduated scale, independent of and behind the main beam, and by a special carrier denotes accurately the position of the rider on the main beam. Such an independent scale allows of smaller scale-divisions. Another balance is equipped with a device known as a multiple rider. It is an attachment operated from outside the case, which places riders on a suitable support the equivalent of placing flat weights on the pans. The makers claim constancy of weights and a saving of time for the mechanism. The bearings of all types of button-balances are made of agate, and considerable skill is necessary to form the crude stone into fine knife-edges. All button-balances are equipped with fall-away panrests. Control of the balance is secured by one turn of an outside thumb-screw. The action at first releases the pans, and turning still farther sets the beam free. A button-balance should be carefully adjusted. It should be tested for sensitiveness, for stability of poise, and for equal arms. The graduations on the beam should also be tried out.

Installation, Care, and Operation of Balances.—Special precautions are necessary on installing a delicate balance. A good strong table set on a firm floor usually suffices for the foundation of an analytical balance, and such a support may answer for a button-balance. It is best to set the latter on a firm foundation of stone, concrete, or wood. A good rest may be had by cementing two 8-in. iron pipes into a solid foundation. The pipes pass free through the floor and have a heavy timber bolted firmly to their top at a working height. Unusual precautions may have to be taken on installations subject to vibrations.

There is one source of trouble that may constantly annoy an operator, and that is the tendency for a balance to become magnetized. Even so-called non-magnetic beams seem subject to this complaint under certain conditions. In some parts of the Southwest, where sandstorms are common, the static electricity generated by particles of sand striking together will incapacitate a balance for fine work for the duration of the storm. Such a condition may be overcome to a certain extent by grounding the balance with copper-wire. Matters are often made worse by an insulated base which prevents the balance from discharging. When using a balance it is best to avoid rubbing the glass case. A balance may often be discharged by pressing the fingers against the case. While the balance-room should be well lighted, it is necessary that the direct rays of the sun should be kept out. Such rays, while they may strike the balance for only a short while, will destroy its equilibrium for some time afterward. The balance-room is usually found on the north side of the laboratory. As even a temperature as possible should be maintained and any local source of heat, such as an electric light, kept at a safe distance. The room should be separate from the main laboratory, be dry and not subject to vapors or draughts. A good operator handles his balance carefully. It should be kept clean, and the cleaning up is best done after the day's work is over, as the balance has then a long period of rest until the next weighing, to assume its equilibrium. A cloth cover is kept on the balance when it is not in use.

When starting to weigh it is customary for an operator to test the balance for equilibrium, as he may for one thing have left the rider on the beam and then forgotten it. When weighing grams or half-grams on an analytical balance the usual custom is to weigh by 'no deflection,' disregarding friction and inertia. Heavier weighings, as for instance the platinum cylinders used in electrolytic copper-work, are weighed by swings. The beam is best set in motion in such a case by dropping the rider an instant upon it. Button-work is always weighed by swings. A certain system should be adhered to when weighing by swings. For example, the first swing of the pointer to the left is disregarded; the pointer then swings over to the right and that reading is noted and made to agree with the next swing of the pointer to the left. Such a system can be used only on a sensitive slow-acting balance, as otherwise the quick decrease in the length of swing would prohibit it. As it is, it implies that the true zero of the pointer is not that of the graduated arc. For testing a balance it is perhaps best to take the mean of the swings to the right and left, but in practical weighing such procedure is too slow. In determining the weight of a substance a certain system of testing the weights is used by all operators.

Weights.—To weigh accurately it is necessary to have accurate weights. Riders and weights are often used which are not of true weight, hence the necessity for checking all weights before using. Button-balance weights must be standard, and those in use on analytical balances likewise. As weighings on the analytical type may be relative, it follows that

if the set of weights agree one with another it suffices, but it precludes the use of weights from another set unless all are standard. An assay-office should possess a set of standard weights, and such a set should be used for no purpose other than comparison with working-weights. For designated fees sets of weights or individual weights will be accurately weighed, classified or made standard by the Government Bureau of Standards in Washington. Manufacturers of weights will send weights to the Bureau at the request of a buyer, and they often keep on hand such Government standardized weights in boxes sealed with the Bureau's seal to save purchasers time and bother. The manner of keeping standards in the Bureau, and the method of checking and classifying the weights submitted, is very interesting. It is all to be found in Bureau Circular No. 3, of the U. S. Bureau of Standards, Department of Commerce and Labor. A tolerance on weights is allowed by the Government according to the class and size. On assay weights of $^1/_{10}$ to $^1/_2$ mg. a tolerance of $^1/_{100}$ mg. is permissible, and so on up to a weight of 20 kg., where 200 mg. is permitted. Actual weights are determined very closely by the Bureau, being reported to $^1/_{1000}$ mg. on tenths of milligram weights. The Bureau requires the weights to be of suitable material and after standardization specifies careful treatment to preserve constancy.

Very accurate weights and riders may be purchased from the makers. They are sold in the smaller sizes under classes, the best class showing the smallest deviation from the true weight. First-class riders from ½ to 12 mg. are guaranteed to be within $\pm$ $^2/_{1000}$ mg. of the marked weight. The lower, or commercial class of the same riders, may deviate $\pm$ $^{15}/_{1000}$ mg. Small flat weights are not so accurate. Shapes of weights in use agree very closely, with the exception of those adapted to the multiple-rider balance. Weights below 1 gm. are usually made of platinum, and above 1 gm. of brass. Platinum keeps a very constant weight with proper handling. Brass weights may show a tendency to vary, and for that reason when weighing platinum cylinders, where a number may be required, the same brass weights should be used on all weighings of the same cylinder.

The largest vertical gas-engine in the world was recently started in the plant of the Castner-Kellner Alkali Co., Ltd., Runcorn, England. It was furnished by the British Westinghouse Co., and is capable of developing 1000 hp. No water cooling is used for any of the moving parts. Forced lubrication is used throughout, the oil pumps being in duplicate, and these can be examined and the oil sieves changed while the engine is in operation. All valves are positively operated by means of straight push rods actuated directly from the cam shaft. The engine is direct-connected to a generator supplied by the same company.

Evidence from the mounds of Ohio shows that the copper deposits of Michigan were known to and worked by the mound-builders.

BRITISH COLUMBIA MINERAL PRODUCTION DURING 1907.

The annual report for 1907 of the minister of mines of British Columbia has recently been issued. The value of the mineral products of the Province for the year 1907 is greater than that of any preceding year, amounting to $25,882,560, showing an increase over the last year of $902,014, equivalent to an increase of 3.6%, and is 15.2% greater than the output of 1905, and 36.3% greater than that of 1904. An analysis of the returns shows that this increase is due to the greater tonnage of low-grade ore mined in the Boundary district, and also to an increased tonnage from the collieries, both in coal and coke. As regards quantities, the production of placer-gold last year was the smallest reported since 1898; that of vein-gold was the lowest since 1900. Silver was less than in any year since 1895, and lead less than in any year since 1904. The copper output was greater than that of any previous year since 1906. The coal output in 1907 was the largest ever made; coke had only been exceeded once, namely, in 1905.

The ore mined in the Province during the year 1907, exclusive of coal, was 1,804,114 tons. This was produced by the various districts in the following proportions: Boundary, 65.1% of total; Rossland, 15.8; Coast, 4.7; Fort Steele, M. D., 8.6; all other districts, 5.8. The number of mines from which shipments were made in 1907 was 147; but of these only 72 shipped more than 100 tons each; 36 in excess of 1000 tons each.

The production for the year, divided as to the several minerals, is as follows:

	Quantity.	Value.
Gold, placer ..... oz.	.....	$828,000
Gold, lode ..... oz.	196,179	4,055,020
Silver ..... oz.	2,745,448	1,703,825
Lead ..... lb.	47,738,703	2,291,458
Copper ..... lb.	40,832,720	8,166,544
Total metalliferous	.....	$17,044,847
Coal ..... long tons	1,800,067	6,300,235
Coke ..... long tons	222,913	1,337,478
Building materials	.....	1,200,000
Total values	.....	$25,882,560

A comparison shows that British Columbia produced more gold, copper, and lead than all the rest of the Canadian Dominion combined, but that Ontario has surpassed her in the production of silver. The Province produced no nickel and practically no iron.

The total mineral production of British Columbia from the first record to and including 1907 is as follows:

Gold, placer	$69,549,103
Gold, lode	45,070,717
Silver	27,289,833
Lead	19,917,197
Copper	43,713,122
Coal and coke	86,972,511
Building stone, bricks, etc	6,693,100
Other metals	320,699
Total	$299,526,282

THROUGH THE BOLIVIAN HIGHLANDS.

Written for the MINING AND SCIENTIFIC PRESS
By E. P. MATHEWSON.

Few people realize that an overcoat is a useful article on board ship at the equator. The Humboldt current follows the west coast of South America from Tierra del Fuego to the equator, where it turns west. It plays an important part in the regulation of the weather conditions, particularly as to rainfall. The prevailing winds are from the west. The moisture-laden clouds from that direction meet the cold air above the Humboldt current and precipitate their

Caliche Mining, Tarapaca, Chile.

burden in the ocean. The high range of the Andes prevents rain clouds reaching the west coast from the east, so there exists a strip of land that is practically rainless from Coquimbo, Chile, to Guayaquil, Ecuador, varying in width from 100 to 300 miles, and in elevation from sea-level to 15,000 ft. above tide. Occasionally a fertile valley is seen running from the coast to the Andes, where some stream works its way from the snow-capped mountains to the sea. In these valleys semi-tropical vegetation is encountered, and it is from these that the famous long-staple Peruvian cotton comes. One of the most arid provinces of Chile is Antofagasta, with a capital city of the same name, known chiefly in this country in college song. From Antofagasta there extends a line of 28-in. gauge railway to Oruro in Bolivia. This was, until recently, the only railway extending into that Republic. It was built by the Cia. Huanchaca de Bolivia with capital advanced by an English syndicate, which syndicate owned the railway but rented it from the date of its completion until a few years ago to the company that built it. The Huanchaca Co. is to Bolivia what the Anaconda Copper Mining Co. is to the State of Montana, and more. It is the one great enterprise of the country. It owns the silver mines at Pulacayo, Bolivia.

Antofagasta is the chief shipping point for all Bolivian products. Its chief industries at the time of my visit in 1901, were the smelting of the Pulacayo and other ores at the smelters, known as the Playa Blanca & Templeman, the refining of nitrate of soda at one establishment, and the forwarding of merchandise from and to Bolivia. Since that time the nitrate deposits have been prospected extensively on the Pampa across the lowest or first coast range, with the result that there are now 13 *oficinas* for nitrate, the port is congested with traffic, the new port of Coloso, a few miles south, has been opened, and the old and much better port of Mejillones has been reopened and connected with Antofagasta by a line of railway. Antofagasta is now as great a nitrate port as Iquique, 40 sailing vessels or 'wind-jammers' frequently loading and unloading at one time, in addition to numerous steamers. It is a dry town in one sense, only one rain worthy the name having fallen in two years.

The railway equipment is somewhat miscellaneous. The locomotives are mostly of European make, and the passenger coaches are American. Most of the freight cars are no larger than a good-sized ore-wagon, holding only 5 metric tons. Cars recently purchased have brought the maximum load up to 20 tons. No air-brakes were in use, but a peculiar form of hand-brake, in which the brakeman turned a crank, was employed instead. The road is up hill all the way to Bolivia, and a good stiff grade it is most of the way. Passing a little canyon in the first range of hills the train reaches the first pampa. At Pampa Central are indications of nitrate mining.

The genial superintendent of the mines invited the travelers to lunch, and as the train had only 150 miles to make during the first day there was plenty of time to enjoy his bounty with *vino rojo* or *blanco del pais* (native red or white wine), according to taste. Calama was reached by nightfall. Trains on this railway, and many others in South America, do not stay out after dark. Each station and yard is fenced in and gates are closed across the tracks and the trains are locked in for the night. Calama is a small settlement in an oasis in the desert.

Atacamite Mine, Chuquicamata, Chile.

There is no running water between Antofagasta and Calama. The river Loa, rising in the Andes not many miles away, flows through the town, and a few miles beyond sinks in the sand and disappears forever. To supply water for Antofagasta an 8-in. pipeline is laid alongside the railway from the source of the Loa to Antofagasta, a distance of about 200 miles. The difference in elevation between the highest point and sea-level is nearly 15,000 ft. Consequently relief tanks have been put in along the line

at frequent intervals to reduce the pressure. These tanks are open on top and consequently the dust of the desert, mixed with salt and borate of lime and some nitrate of soda, blows into them, contaminating the water, so that it has to be distilled before using. Sea water is still the only water supply in many places along the coast of Chile. It is distilled, of course, for domestic use, but is used 'straight' in the boilers, zinc plates being hung in the boilers to prevent corrosion.

But to return to Calama: There are a few acres of alfalfa in the vicinity of the town, and the crop saves the lives of the animals that are driven across the desert of Atacama from the Argentine Republic to the coast. Calama was also, up to the time of which I write, the shipping point for Chuquicamata copper ores. Now a spur of the railway is extended to Chuquicamata.

The name Chuquicamata is said to be derived from Indian words meaning 'here is gold.' Some concentrating or gold panning was done here by the Indians in the early days. Later they discovered the copper ore, atacamite, a volatile oxichloride of copper, of brilliant green color. The surface rock is greatly shattered, and in the cracks were deposited crystals of the atacamite and also sulphates of copper and iron.

The aborigines used stone hammers bound to willow handles with rawhide for breaking down the rock; for wedges willow branches were employed, and rawhide punched full of holes served for sieves. The material that passed through the sieves was their ore; all the rest was counted as waste.

A very valuable find from an archaeological point of view was made at Chuquicamata about 1899. In opening a mine the mummied remains of an Indian were found where he had been killed by a 'squeeze' of rock. The face and trunk were badly smashed, but the rest of the body was perfect.

The modern system of separating the atacamite is by crushing and screening in trommels. The resulting fine stuff or 'clampos' are sometimes concentrated on Wilfley tables near Calama, and the product, containing 40% copper, is shipped to Swansea, where it is made into bluestone. There was, at the time of my visit, a quantity of copper sulphate ore shipped to Antofagasta and treated there with water slightly acidified with H_2SO_4, and then precipitated on scrap-iron as metallic copper. A small modern smelting plant had been erected near Calama and run for a time on the sulphide ores which were beginning to come in about 400 feet below the surface.

Perhaps the nearness of the volcanoes, San Pedro and San Pablo, 16 miles east, one of which is constantly emitting thin clouds of vapor, may account for the shattered rock of Chuquicamata. Earthquakes are frequent and somewhat severe. There are no 'sky-scrapers' to increase the disaster, but a one-story stone section-house near the mountain collapsed during one earthquake in 1901, injuring all the occupants. The shock was felt distinctly 200 miles away, in Antofagasta. A wealthy Bolivian on his way in a special train from Oruro to Antofagasta was near the volcanoes when the shock occurred. The train-men found boulders on the track, so the train was started back toward the last station, but the ballast, consisting largely of pumice stone, had been shaken out so that the party had to wait for 24 hours until a relief expedition arrived.

The Chilean miner is one of the best single-hand drillers in the world, but, like most Latin-Americans, he needs the incentive of a fixed task or a contract to call forth his best efforts. He is a stoutly built fellow with fine chest and big arms, having a good deal of the Araucanian Indian blood in his veins. The Araucanians were never completely conquered by the Spaniards.

Leaving Chuquicamata the road passes close by the volcanoes of San Pedro and San Pablo. The plain round about the volcanoes shows the result of many outpourings of lava and volcanic hail. There are great deposits of sulphur on the sides of the volcanoes, and one enterprising Spaniard has a monopoly to mine or quarry the sulphur on all the volcanoes in Chile. He has a small refinery in Antofagasta and sells his product for the manufacture of powder at the nitrate *oficinas*.

The next important point is the borax lake of Ascotan, 12,000 feet above sea-level. This looks like a lake covered with ice and snow. The Borax Consolidated, Ltd., owns the lake, and the method of obtaining the borate of lime is to use pick and shovel after removing a few inches of the top deposit. The borate of lime thus obtained contains considerable moisture. It is therefore piled up in sharp conical piles to dry, then sacked and trammed to the railway station, where it is shipped to Antofagasta for further drying in muffles, using coal for fuel. It is then ready for shipment to Europe.

At the station where the borate of lime is shipped we saw our first vicuña. These yellow-brown relatives of the camel are peculiar. There are four varieties of the camel family to be found in the Andes. The vicuña, and guánaco, which are wild animals, and the llama and alpaca, which are domesticated.

There are three principal native fuels in Bolivia, *yareta*, a resinous moss mostly found below the surface of the ground, which is cut up into blocks like adobes; *taquia* or llama dung; and *turba* or peat. Analyses of these fuels are given below:

	Volatile Combustible.	Fixed Carbon.	Ash.
Yareta (dry)	67.79	17.12	15.09
Taquia	41.94	10.35	47.71
Turba, A	51.74	18.22	30.04
Turba, B	52.96	21.42	25.62

The next important station is Ollague, at the foot of a smoking volcano of the same name, near the western boundary of Bolivia. It is about 12,000 ft. above sea-level, and stands on the pampa, a vast plain or table-land with the main range of the Andes on the east and a lesser range on the west. The peaks of the Andes are like cones, sticking up 17,000 to 20,000 ft. toward heaven. All the higher peaks are permanently snow-capped. At dusk the train arrives at Uyuní, the junction point for Pulacayo and Huanchaca.

(To be Continued.)

VOLCANIC WATERS.

By John B. Hastings.

*The origin of the watery vapors of vulcanism has always been an object of interest and speculation to the seismologist, and as theories of the genetic origin of ore deposits have of late years been pretty well narrowed down to the expiring forces of plutonic action, the same question has had a lively interest for mining engineers and geologists, as is well shown by the discussions on the subject in the *Transactions* of the American Institute of Mining Engineers. The important part taken by volcanic emanations in the origin of pegmatites and quartz-veins, and their latent power to concentrate into useful deposits such scattered gold as occurs in the Hartsel granite, make a discussion of their derivation but a natural third and final step.

It is conceded that enormous amounts of vapor accompany vulcanism, though perhaps we are apt to forget that steam has 1700 times the volume of water, besides which the column seen over Vesuvius and other volcanoes is greatly mixed with air; the immensity of such volumes compared with solids and liquids is shown by the experiment of Gautier, who, by heating dessicated granite to 100° C., evolved from it gases 20 times, and steam 90 times, its own volume. Dana appraised the average amount of water left in ordinary rocks as 2.5 per cent.

T. M. Read estimated that the Mississippi river carries to the sea annually 150,000,000 tons of rock material. If these Mississippi sediments, as deposited, contained 20% water, it would be 600,000,000 cu. ft., or 4,500,000,000 American gallons, annually. Allowing the vapor suspended over a volcanic cone to be mixed with 80% air, this amount of water converted into steam would replenish anew, every 9 min., a column 15,000 ft. high, 2000 ft. diam. at the base, and 10,000 ft. at the top. Read's estimate is only half of the amount given, and is a more recent and probably correct one.

In the present papers, however, it is not intended to dispute estimates of the vapors accompanying vulcanism, or what part of it springs from primeval hydrogen and oxygen locked within the earth's interior, or from vadose or oceanic waters. It is simply my purpose to ask whether any of the water buried deeply with oceanic sediments can make its way to the conduits of molten material. An immense amount of water is buried with sediments, and it probably stays there until removed by the rise of the isogeotherm, either a gentle rise or a comparatively sudden one, accompanying the movement. Experience in cyaniding teaches that water will stay in interstitial spaces until displaced by another substance or exhausted into a vacuum. Hence, the spaces left in compressed sediments will be full of water, unless the isogeotherm rises as the sediments are laid down and expels it. The gentle action of heat is aided by the expansion and loss of viscosity of warmed water; the latter quality is said to be about one-fifth at 100° C. of what it is at 0° Centigrade.

* Abstract from *Trans.* Amer. Inst. Min. Eng., pp. 345-354, 1908.

Though enormous pressures can be figured on every square inch of buried sediments, the evidence of compression in them, except where there has been movement, is not great. The pulpy matter of rotted sigillaria, etc., has been crushed to perhaps 1% of the original volume, and converted into bituminous coal; but even this coal is not a very dense material to preserve its form over areas of many square miles when buried under thousands of feet of rock subsequent to the Carboniferous age. It takes extreme pressure and heat to make anthracite.

As to the rise of the isogeotherm from normal conductivity or pressure, there is little light, except theoretical. The continents show increased temperature with depth, but they are areas of considerable movement—elevation—which in itself would be accompanied with heat, and what remains may be in part residual. The same might be said of the ocean bottoms, substituting a movement of depression. If the heat-conductivity in the earth be judged by its radiation it is very slight. It has been described as small, but still measurable. The abyssal ocean waters are just above freezing-point. This low temperature has been thought to be due to rapid extraction of the earth's heat from the oceanic beds by conductivity because of their greater density than the continents, for instance, and the rapidity with which the waters absorb the heat and quickly distribute it through convection. Again, it has been ascribed to the immense polar currents moving slowly southward along the bottom. It is hard to find any warmth in the ocean except that due to the rays of the sun. Chamberlin and Salisbury,[1] citing P. G. Tait's *Heat* and A. Daniell's *Physics* assert that these authors respectively place the earth's loss of heat in 100,000,000 years at 18° F. and 81° F. for the whole body of the planet.

Do the sediments as deposited contain much water, and do interstitial spaces survive compression of the beds? J. D. Dana thought that "sedimentary beds contain their maximum of moisture when laid down; and with this, though situated at the bottom of a trough, they have still laid quietly." Not much has been said of late by geologists about water carried down in sedimentary beds as they are deposited. T. Sterry Hunt and others referred to it, and thought that some eruptive rocks were formed from saturated sedimentaries. Perhaps the only emphatic recent article bearing on the subject is by F. H. King,[2] which not only treats of the amount of water the sediments might once have held, but presents a study of them after elevation, and shows their storage capacity up to the present time. The following passages are from his work: (P. 69) "* * * sandstones lying below drainage outlets may contain water up to 38% of their volume. * * * The Dakota sandstone, for example, stretching from the foothills of the Rocky Mountains eastward beneath the plains of the two Dakotas, Nebraska, and Kansas, apparently in one nearly or quite continuous sheet, may be likened to a submerged inland sea

1 Chamberlin and Salisbury, 'Geology,' 2nd ed., p. 572.

2 F. H. King, 'Principles and Conditions of Movements of Ground Water,' U. S. Geological Survey, 19th Annual Report, pt. II., pp. 59-294, (1897-98).

or lake, for wherever this formation lies beneath the zone of saturation it carries within itself from 15 to 38 ft. of water on the level for every 100 ft. in thickness of the sandstone, and from it water may be drawn wherever it lies close enough to the surface to be reached by wells. The Potsdam sandstone is a formation of much wider distribution than the Dakota, and in southern Minnesota, Wisconsin, Illinois, and Iowa it has a measured thickness of 500 to 1000 ft., all lying beneath the surface of saturation, so that in this great bed there has been stored a quantity of water equal to a sheet not less than 10 to 38 ft. deep for each 100 ft. of thickness, and 500 ft. of this water-bearing rock may store the equivalent of an inland submerged sea having a mean depth of 50 to 190 ft. of water." Ordinary clay with sand held 25% water, and very fine sand 17%. Marble held very little, 0.25%, or a column of 5000 ft. held 30 ft. of water. Experiments with sediments laid down in a cylinder showed that the water flowed downward or laterally through the sediments and up through a rubber tube discharging 6 in. above the top of the column of water and sediments; it was not denied that some water, as the sediments were deposited, may have come up vertically through them, but the lateral and downward outlet seemed to be the line of least resistance. (P. 80) "We have no quantitative measure of the amount of compression which, under the conditions of natural sedimentation, takes place where beds of shale and limestone are formed. * * * Such consolidation of sediments and displacement of water as may have taken place by the ordinary processes of sedimentation, unaided by other agencies, must still have left large volumes of enclosed water to be deeply buried in districts like the Appalachian region, where, during Paleozoic time, if the estimate of Dana be accepted, an aggregate subsidence and sedimentation of 36,000 ft. must have taken place."

When these materials were laid down the pore-space was about 33%, or 12,000 ft. of water. But these rocks have since been greatly consolidated, highly metamorphosed and crystallized, perhaps making the pore-space much less than 33%, so that if they were now full of water a very large amount would have been displaced in the past. The same thing has occurred in the interior region of our continent. (P. 81) "These large volumes of water which have been carried beneath the earth's crust as a phase of the process of sedimentation must in part have re-appeared at the surface in one place or another, and there must of necessity be an underflow of the entrapped sedimentary waters from beneath the ocean toward the land." Such subsidence produces increased temperature of the material, and resultant flow of water.

"Poiseuille found that water at a temperature of 45° C. flowed 2.5 times as fast as water at 5° C. under otherwise like conditions. G. F. Becker[3] says quartz weighs 165 lb. per cu. ft., and quartz sand well shaken down 120 lb. per cu. ft.; therefore the sand contains 27.3% of interstitial space. This compares very well with the natural sand-beds and sand-stones of the California quicksilver mines.

Do sediments subside until they are at an immense depth below the ocean bottoms? The general opinion of geologists, in answer to this question, is here given. J. W. Dawson[4] wrote that 10,000 to 20,000 ft. of sediments in Nova Scotia and the Eastern United States were laid down in shallow seas—that is, the bottom of the seas subsided as they were deposited. In the Alps the sediments which accumulated between the Permian and late Cretaceous periods are thought to exceed 50,000 ft., all accumulated in shallow water. Dana says:[5] "Consequently, when these last layers of the Paleozoic in the Appalachian regions were at the ocean's level, the Potsdam beds, though once also at the surface, were about seven miles below; for this is the thickness of the strata that intervene; seven miles of subsidence had, therefore, taken place in that region during the progress of the Paleozoic ages." Clarence King judged that the subsidence in the Rocky Mountains amounted to 60,000 ft. S. F. Emmons[6] thought that from early Cambrian to early Carboniferous age the great accumulation of beds in the longitude of the Wasatch mountains amounted to 15,000 to 20,000 ft., not strictly without movement of elevation and depression, but without great disturbance. Bailey Willis says:[7] "In the Appalachian trough opportunity for maximum sedimentation during the Paleozoic was afforded by the profound subsidence of an area in New York, Pennsylvania, Virginia, and Ohio. At Mauch Chunk the total thickness is approximately 30,000 ft." R. T. Hill,[8] describing the Beaumont oil-fields, mentions 25,000 ft. of marine sediments, from Cambrian to recent times, minus the Devonian, and says they are "tilted steeply in the mountainous areas, and are nearly horizontal in the plains." (P. 400) "Of the 22,000 ft. of sedimentaries in the Texas section, all but 2000 ft. or less are unconsolidated clays and sands."

These examples might be multiplied. Chamberlin and Salisbury in their new 'Geology,' touch the other side of the question. They allow that subsidence has gone on in epi-continental (shallow bordering) and mediterranean (deep inland) seas, the inland sea of North America, for instance; and do not deny that it occurs elsewhere, but think that errors in computation may have been sometimes made. For instance, suppose sediments deposited conformably on the abyssal floor of an ocean, which slopes 2° until a depth of four miles is reached, whence the floor goes off flat, but the sediments keep on piling up conformably at 2° dip till they are built out 200 miles from shore. An observer at the shore end, taking the angle of dip of the first bed laid down, and protracting it for the 200 miles, which on this dip would take it far below the ocean bottom, and then calculating the distance at right angles to the dip from the bottom of this first sediment to the top

[3] 'Geology of the Quicksilver Deposits of the Pacific Slope,' *Monograph No. 13*, U. S. Geological Survey, p. 399, (1888).

[4] 'Some Salient Points in the Science of the Earth.'

[5] 'Manual of Geology,' 3d ed., p. 391.

[6] 'Geology of the Denver Basin in Colorado,' *Monograph* No. 27, U. S. Geological Survey, p. 15, 1906.

[7] 'A Theory of Continental Structure Applied to North America, *Bulletin* of the Geological Society of America, Vol. XVIII, p. 399 (1906).

[8] 'The Beaumont Oil-Fields,' etc., *Trans.* XXXIII, p. 36², (1903).

of the last one laid down, would get 7 miles, instead of 4, the real depth of the ocean and the true thickness of the sediments. It is certainly plausible that protracting a dip for 200 miles might lead to error. If it were protracted 5 miles the discrepancy would be 0.15 mile. Another instance is given of a lake 100 miles wide, with sides sloping at 3° to a depth of 1000 ft., whence it remained flat. The sediments were then laid down conformably at an angle of 3°. The observer takes the angle of dip at the shore and protracts it at 3° for 50 miles, getting so far below the bottom of the 1000-ft. lake that his computation at right angles to the 3° dip, at the end of the 50 miles, gives a depth of 13,800 ft., instead of 1000 ft. These layers of sediment, diagonal to the depth of the lake, would strike bottom in about 3 miles, that is, if any of the beds were followed from the outcrop down the 3° dip for that distance, they would be found ending in a truncated edge against the lake bottom, so that their horizontal length would be little more than the supposed thickness, whereas the Appalachian relations, as computed, are in horizontal extent 20 times or more their thickness.

Another important question is whether the continental shores are lines of weakness, so that there is a possibility of the enclosed waters of the sediments pasing from them into the land areas. While there are certain parts of the present continents and also oceanic depths which are thought to have existed since the dawn of geologic history, it is well known that almost all of the inner area of North America has been occupied by a mediterranean sea, so that tremendous thicknesses of sediments have been laid down in Arizona, Utah, Idaho, and British Columbia; that the ancient sea of Tethys stretched from Spain to the eastern coast of Asia; that the Arctic was once much larger than now; and also that the southern continents, Africa, Australia, and South America, were apparently closely connected. These facts have been worked out by careful research by such men as Dawson, Dana, and others on our shores and elsewhere. The facts have been lately collated by B. Willis, who says, in effect,[9] that uplands of erosion and lowlands of aggradation are commonly joined by a monoclinal flexure, or a normal fault. Great horizontal movements are shown in the schistose structure of once deep-seated rocks. These movements crowded the continental elements together, as is evidenced by the shortening of the Appalachian sediments from their original horizontal breadth, from 168 miles to 60 miles. Lately, however, the narrowing has been put at 35 to 45 miles. Much may depend, perhaps, on the locality of the section observed. That oceanic areas might be denser than continental, probably appeared early to a number of minds and was mentioned by some, but E. P. Dutton was the first to formulate with emphasis the theory of 'isostacy,' which predicates that the sectors of the oceans and continents are in equilibrium, the depressions of the one and the elevations of the other equalizing the specific gravity of the two. Willis calls the oceans and continents positive and negative elements, and specifies the line of contact between them as a zone of weakness, especially favorable for the development of intrusive and extrusive bodies. It may be interesting for a moment to glance at B. K. Emerson's[10] statement of the theory of a tetrahedral earth as postulated by its originator, W. L. Green, a Honolulu merchant: "The sphere of all solids contains the greatest volume under a given surface, the tetrahedron the least volume under the same surface. The solid spherical crust of the earth, then, collapsing upon its plastic interior, would tend toward the tetrahedral form as the one which would co-ordinate the greatest diminution of the interior with the least change of the surface." The continents are shown to be situated more or less on the protuberances of the tetrahedron. Emerson says the tendency for the earth to take such a form may be allowed to exist and would be in evidence where not balanced by other forces. However, approached by geologic theory, I think it is generally acknowledged that continental shores are broad lines of weakness; furthermore, that the general arrangement of volcanoes, as taught by Dana and others, is symmetrical with these lines. This does not preclude volcanic action far away from the coast. If the elevation of the continents is due to the thrust of the denser oceanic beds, large distances may be insignificant. Neither does it preclude vulcanism under the ocean. It matters not that there are quiescent areas, where under this law vulcanism might be expected to be active. Many have observed the marked feature of critical epochs in the world's history, that there have been geological periods of slow subsidence and elevation without much vulcanism.

The depth of vulcanism may be great, but the depth of earthquake centrums, which we associate with movements in the earth's crust (faulting), originally considered as great (even from 30 to 55 miles by Mallet), has of late years been restricted to 5, 8, or 12 miles, which brings it not so much below the sedimental range.

Are the waters of vulcanism similar to those included in sediments? Since it is not supposed that these waters are exclusively derived from the sediments, they may be greatly modified mixtures as we see them. Prestwich says:[11] "Not only are almost all the elements of sea-water found in the gases and deposits of fumaroles, with the exception of magnesia which has become fixed in the lava, but sea-salt itself is often found in lava or is deposited on its surface." The *Challenger* expedition Reports give the salts of sea-water as roughly: sodium chloride, 78; magnesium chloride, 11; magnesium sulphate, 5; calcium sulphate, 4; potassium sulphate, 2; calcium carbonate, 0.25; magnesium bromide, 0.25%. The total quantity of salts is fairly uniform at 3.5% of the water. The salts vary; sometimes the bromides are more plentiful, and strontium, iodine, fluorine, glauconite, etc., are found.

[9] 'The Mechanics of Appalachian Structure,' 13th Annual Report, U. S. Geological Survey, pt. II, pp. 211-281, (1891-92).

[10] 'The Tetrahedral Earth and Zone of the Intercontinental Seas,' *Bull.* Geol. Soc. Amer., Vol. XI, pp. 61-106, (1899).

[11] 'Geology: Chemical, Physical, and Stratigraphical', Vol. I, p. 213, (1886).

MINE REPORTS.

ZINC CORPORATION, LTD.

The *Mining World*, of London, reports proceedings of interest at the recent ordinary meeting of the stockholders of the Zinc Corporation, Ltd., from which the following statement by H. C. Hoover is abstracted:

The ore at Broken Hill contains lead, zinc, and silver. The mining companies there crush this ore to the fineness of sand and extract from it, by water concentration, about 60 to 70% of the lead and silver content. The residue from this treatment, which is sent to the dump contains, therefore, practically the whole of the zinc and between 30 and 40% of the original lead and silver content in the ore. The Zinc Corporation already bought and paid for about a million tons of these residue dumps, and has the right to buy about a million tons more. The residue being treated at the present time is from the Block 10 mine, and averages about 20% zinc, about 8 oz. silver, and about 5 or 6% lead. The residue from these old dumps is taken by the Corporation's own railway and dumped into large bins underneath the track at the works. From here the material is carried by a belt-conveyor to bins at the top of the mill. Thence it passes automatically to Huntington mills and grinding pans, to be reduced to further fineness. After this re-grinding, the material passes to agitators, in which it is mixed with oil and sulphuric acid, and is drawn from the agitators through Elmore vacuum machines, and the zinc, lead, and silver are concentrated out, the product being mixed zinc, lead, and silver concentrate. This completes the first stage of the treatment. The second stage is the separation of the lead from the zinc in this mixed concentrate, making two concentrates, one in which zinc predominates and one in which lead is the principal content. The reason for this second treatment lies in the terms upon which the concentrate has to be sold. The zinc smelters will pay only for lead in the concentrate in excess of 8%, and then only half the value of the lead. Likewise, they will only pay 1s. 3d. per oz. for the silver over 5 oz. per ton, and then pay for the zinc content at the average price of zinc over the year of purchase, less the cost of shipment to Europe, smelting charges, loss in recovery, and profits on smelting. Nor will the lead smelter pay for zinc in the lead concentrate—in fact, a penalty is imposed if there be more than 12% zinc present.

In order to give tangible figures it is necessary to assume prices, as, for example, of zinc £19 5s. per ton, and lead £12 10s. Now, the average price of zinc for six years has been £23, and lead £13 16s. But we are now in the midst of a great depression, and the price of zinc is today £19 5s., and lead £12 17s. For the fist half of the year it averaged £20 10s., so that even if it averages only £18 for the balance of the year, the year's average will still be £19 5s., and we sell on the year's average. By the end of this year the tide of depression will probably have turned. The average content of this mixed concentrate is about 43% zinc, 12% lead, and 16 oz. silver. If we sold this material at this stage to the zinc smelters, we should get but little pay for the lead and silver content, so that our great objective has been to devise a secondary treatment to extract as much lead and silver as possible from the mixed concentrate, to be sold as a lead concentrate. This has a second very great advantage, as, by taking away the lead, we increase the proportion of zinc in the zinc concentrate and it becomes more valuable. Therefore we have devised, after exhaustive investigation, a method by which we take the mixed concentrate and re-treat it to separate a lead concentrate. In this feature of the work we have succeeded to a considerable degree, for we now obtain lead concentrate at the rate of 230 tons per month, and by doing so increase the content of the zinc concentrate from 43 to 47% zinc. This means that on the present output, if we sold the mixed concentrate as its stands, we should realize about £3500 less than we do realize by first separating a portion of the lead, so that there can be no question as to the success of this secondary treatment, to which practically all the profit is due. There are several aspects of the treatment which have an important bearing on the future of the Company. On the basis of last week's output we are earning a net sum of £7000 per month above all expenses, out of which about £3000 should be set aside for cost of tailing worked up, or a net amount of about £4000 per month, or £48,000 per annum profit.

This profit is capable of very important increase from many directions. First, the working expenses are always high at the initial stages of a new plant. Although the plant is absolutely mechanical, and no human hands touch the material from the beginning to the end, it takes months to train men and organize them to the best advantage. In this business men have to be trained from the ground up, as this is entirely a new business in which no men of experience can be obtained. Moreover, we have been buying water, and we shall soon be prepared to bring in our own supply for at least part of the year. Expenses at the start were about 14s. per ton, and for the month of June were reduced to 12s. 3d. per ton. I believe it will be ultimately decreased to 8s. per ton, which would give an additional profit of over £2500 per month. Second, the mill is treating about 13,000 tons per month. By gradually strengthening the weaker links of the plant this can be increased by 1000 or 2000 tons per month. This would mean an increase in working profit by £500 to £1000 per month. Third, we are obtaining an extraction of over 88% of the original zinc content of the residue. This shows an increase from about 72% the first month. We have obtained in systematic experimental work as high as 92% extraction of the zinc, so that we may make minor improvements here. An additional 4% recovery would augment profits by £500 per month. Fourth, the improvement in re-treatment of the mixed lead and zinc concentrate is one where very important possibilities lie. The lead extraction from the original residue at present averages about 70%. This, in the first instance, is mixed with the zinc in the Elmore concentrate, but we get out of the mixed concentrate only a part of the lead which is equal to an actual extraction into final saleable lead of only 17% of the lead in the original material. In experimental work we averaged a recovery of 40% of the original lead, instead of 17, as above. We hope eventually to duplicate this in regular operation of the plant. If we do so the increased profit from the extra lead and the further increased purity of the zinc would, on the present tonnage, and at the metal prices given, amount to between £2500 and £3000 per month. We have, therefore, a possible increase of the present profit from reduction of expenses of £2500 per month, from increased zinc extraction £500, from increased tonnage £500, and from increased lead extraction £2500, or a total of £6000 per month, or £70,000 per annum, and this without increased price of metals. To do this, or something approaching it, we shall need to lay out £7000 or £8000.

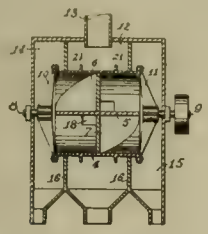
To recapitulate, at the present moment we are earning a profit above the cost of the material we treat, and on present low prices of metals, of about £48,000 per year. If we succeed in these technical improvements, we shall raise it to over £100,000 per annum. I cannot guarantee that we shall accomplish this. We have had such results for short periods, and every week since we started has shown some improvement. The other great element of certain expansion for the Company's profits is a return of metal prices to normal. The average price of zinc over six years is £23, of lead £13 16s. For the calculation given zinc has been taken at £19 5s., and lead at the present price of £12 10s. On the results already attained our profits would have been greater by £5000 per month, or £60,000 per annum had normal prices prevailed. If we accomplish the technical improvement outlined above, and also have the happy coincidence of normal prices of metal, the profits of the Company with this mill will be over £150,000 per annum, instead of £40,000 at present.

The JEFFREY MFG. CO., Columbus, Ohio, has recently issued Bulletin No. 25, the title of which is 'Handling Coal and Ores,' and Bulletin No. 16, describing the Jeffrey A-5 electric rotary drill.

MINING AND METALLURGICAL PATENTS.

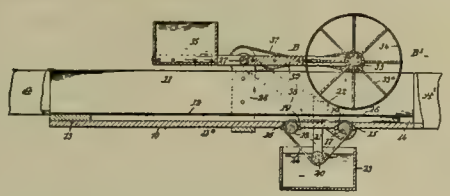
Specially reported for the MINING AND SCIENTIFIC PRESS.

ORE-SAMPLER.—No. 888,471. Charles L. Constant, New York City.



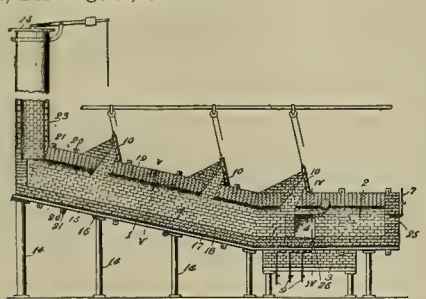
In an ore sampler, a revoluble drum having a longitudinally dividing partition and having oblique partitions, one at either side of the longitudinal partition, said drum being provided with means for receiving ore onto and discharging it from the said oblique partitions.

SULICE-BOX.—No. 893,368. Neil Quigley, Dawson, Yukon, Canada.



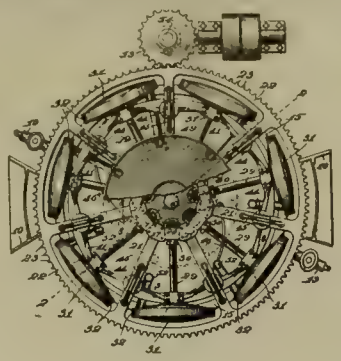
The combination with a sluice-box and a screen spaced from the bottom thereof, the space between the bottom and the screen being closed at the inlet end of the sluice and opened at the outlet end, the said bottom of the sluice adjacent to its outlet end being provided with openings, a roller mounted to revolve in each of said openings, a third roller mounted to revolve between and below the rollers in the bottom of the sluice, and an apron of absorbent material carried by said rollers, of a counterbalance water-wheel extending within the sluice above the screen, being operated by the water passing through the sluice, and a driving connection between said wheel and one of the supporting wheels for the said apron.

METALLURGICAL FURNACE.—No. 894,107. William N. Best, Los Angeles, California.



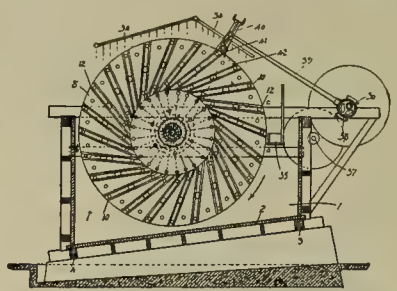
A metallurgical furnace comprising a reducing chamber having an inclined floor, a fire chamber toward which said floor slants downward, a vestibule between said fire chamber and reducing chamber, the floor of the vestibule being lower than that of the fire chamber, a laterally disposed crucible chamber, a fire passage opening communicating between the crucible chamber and the vestibule, said passageway being provided with a floor sloping downwardly from the vestibule into the crucible chamber, an oil-burner inlet opening into the fire chamber at the end opposite the reducing chamber, an oil burner arranged to direct the fire through said opening into the fire chamber, an oil-burner inlet opening into the crucible chamber in the end opposite the passage into the vestibule, and an oil-burner arranged to direct the fire downwardly into the crucible chamber.

ORE-GRINDING MILL.—No. 893,535. Charles D. McLure, St. Louis, Missouri.



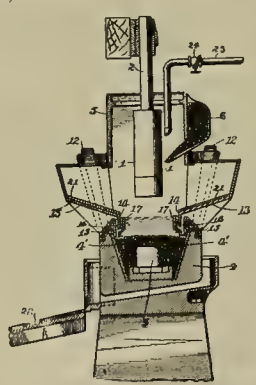
In an ore-grinding mill, a low conical base, a trough formed around the edge thereof, a series of segmental plates removably positioned on top of the base and extending from the trough to the apex of the base, upwardly extending lugs formed integral with the upper ends of the plates, a retaining ring arranged around the lugs, and a plurality of grinding wheels arranged to travel in the trough.

CONTINUOUS FILTER.—No. 893,104. Robert Schorr, San Francisco, California.



In an apparatus of the character described, the combination of a hollow pivot, a filter wheel rotatably supported thereon, a circular series of filter units carried by said filter wheel, means for supplying to said filter units the material to be filtered, means for drawing the filtered liquid from said units comprising conduits leading from said pivot severally to the interiors of said units, a pipe leading to the filter wheel, and means whereby, in the rotation of said wheel, said conduits are connected in succession to said pipe, substantially as described.

APPARATUS FOR TREATING ORES.—No. 893,243. Duncan N. Hood, New York.



In combination with an ore disintegrating apparatus, a receptacle in which the disintegration takes place, parts forming an upwardly extending outflow channel of uniform cross-sectional area and also forming a secondary channel intersecting said outflow channel in a substantially horizontal direction, and means for providing a supply of liquid to said receptacle at a uniform rate.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

ENTERING MINE AGAINST CAUTION—INTENT.

The statutes of some of the States make it unlawful for a miner to enter any place in a mine against caution, or to disobey orders, or to do any other act whereby the lives or health of persons or the security of the mine would be in danger. In a prosecution for the violation of such a statute, it was held that the intent to endanger life or property was not an element of the offense; that the intentional doing of an act with knowledge that in so doing life or property would be endangered, was the gist of the action. The caution as used in the statute was held to mean simply to give notice of, or warn against, danger.

Koppala *v.* State (Wyo.), 93 Pac. 662, Feb., '08.

RECORDING CERTIFICATE OF MINING CLAIMS.

The statute of Nevada providing for the recording of certificates of location of mining claims, was held to be directory only; and where the doing of the acts required to make a valid location was fully proved by other testimony, it was said that the location would not be invalidated by a failure to record the certificate thereof.

Wailes *v.* Davies, 158 Fed. 667, Dec., '07.

FORFEITURE OF CLAIM—BURDEN OF PROOF.

Where a party seeks to establish the forfeiture of a mining claim the burden of proof is upon him, and in order to establish such forfeiture, the proof must be clear and convincing that the owner has failed to comply with the law.

Wailes *v.* Davies, 158 Fed. 667, Dec., '07.

MINING CLAIM OF CORPORATION—WORK BY STOCKHOLDER.

A stockholder in a mining corporation is said to have such a beneficial interest in the corporate property that any work done by him on the unpatented claims of the corporation could be counted as representative work, and if sufficient in amount and done at the proper time, would prevent a forfeiture of the claim.

Wailes *v.* Davies, 158 Fed. 667, Dec., '07.

CHARACTER OF ASSESSMENT WORK REQUIRED.

The United States statute requires that not less than one hundred dollars' worth of labor shall be performed or improvements made on a mining claim during each year; but the statute does not specify the kind or character of the labor. It was accordingly held that labor expended in extracting ore from the claim was within the statutory requirements. It is only when labor is performed outside of the boundaries of the claim that its character becomes material, and in that case it must tend to the development or improvement of the claim, or it will not count.

Wailes *v.* Davies, 158 Fed. 667, Dec., '07.

SALE OF MINE—BROKER'S COMMISSION.

A mining corporation was liable for the services of a broker employed by its manager and treasurer, where it received the price demanded for its property and executed a conveyance with the presumed knowledge of the broker's services. This was said to be within the rule that a principal cannot accept part of an agent's act inuring to his benefit and reject that portion to his injury.

Dillard *v.* Olalla Mining Co. (Ore.), 94 Pac. 966, Apr., '08.

CONTRACT OF SALE OF MINE—SPECIFIC PERFORMANCE.

A contract for the sale of a mining claim provided that the purchaser should furnish continuous employment to the seller at the mines at a specified rate per day beginning on a certain date, and terminating when the contract should terminate. The court refused to decree specific performance of the contract on the ground that there was a clear remedy at law in damages for its breach.

Mallory *v.* Globe Boston Copper Mining Co. (Ariz.), 94 Pac. 1116, March, '08.

Books Received.

PRACTICAL IRRIGATION. By Aug. J. Bowie, Jr. 8vo., 232 pp.; Ill.; Index. New York; McGraw Publishing Co., 1908. Price $3 net. For sale by the MINING AND SCIENTIFIC PRESS.

Mr. Bowie, who appeals by the title of his new book to the agriculturist, is of course Mr. Bowie the mining engineer. In fact, he is only bringing his wide knowledge and experience in hydraulic mining and the problems of water-storage and distribution connected therewith, to bear in another direction. But he has done more. He has written a book which will aid the mining engineer as much as the farmer. When he discusses the losses due to evaporation and seepage, flow of water in ditches, water-measurement, development of water in arid and semi-arid districts, flow of wells, pump-duty where large volumes of water are to be lifted, earth tanks, and the like, he is dealing with subjects that no man connected with the development of the natural resources of the country can fail to be interested in, theoretically and practically. The work is written with that finish in style and arrangement which characterizes Mr. Bowie's productions, and a better example of good form in technical publication would be hard to find.

THE ANALYSIS OF ASHES AND ALLOYS. By L. Parry. 8vo., 143 pp. London; *The Mining Journal*, 1908. Price $2. For sale by the MINING AND SCIENTIFIC PRESS.

A completer summary of the methods of analysis for tin, antimony, and arsenic does not exist than this clear-cut statement of Mr. Parry. He has the faculty of brief exposition, and so his 143 pages contain an extraordinary amount of valuable information. The methods of analysis described are with special reference to those complicated products which present difficulties not described in most text-books, such as drosses, scrap, fume, precipitate, slag, speiss, and the like. The methods given embrace all the common metals, but particular stress is laid on tin and antimony. An exceedingly useful feature of the book is the skeleton outline of methods of analysis applicable to a large number of substances, methods of testing chemicals, making and testing standard solutions, and a warning page of errors to avoid; all given in the most readily usable form. It will be a valuable assistant at any chemist's elbow.

Commercial Paragraphs.

The ALEXANDER PIPE CO. reports the receipt of a large order for 2-in. pipe from the Pacific Telephone & Telegraph Company.

CARL A. ALLEN and C. LORIMER COLBURN have formed a partnership for the practice of mining engineering, with offices at 614 Ideal Bdg., Denver.

ATKINS, KROLL & CO., San Francisco, report that they have recently sold two carloads of Anaconda fireclay bricks to the Noble Electric Steel Co., for use in the electric smelting plant at Heroult, California.

The WAGNER ELECTRIC MFG. CO. has recently made an initial shipment of water-cooled power-transformers, forming part of an ultimate equipment of 36 transformers, aggregating 10,530 kw., for the U. S. Reclamation Service in connection with the Salt river, Arizona, irrigation project.

BAILIE & BRANDT CO., 943 N. Main street, Los Angeles, are selling second-hand and slightly used machinery under a guarantee. Every piece is overhauled and thoroughly tested in their own plant. Mr. Bailie is a gasoline-engine expert and the founder of the business, and Mr. Brandt was for 12 years chief mechanical engineer for the Baker Iron Works.

F. W. BRAUN announces that its San Francisco branch house will in the future be operated under the firm name of BRAUN-KNECKT-HEIMANN CO. G. Kneckt and R. Heimann, who have been with the house for the last 15 years, will have the controlling management of the new company. The Los Angeles house will retain the firm name of F. W. Braun.

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EDITORIAL.

SYSTEM is the machine of omnipotence. By it men may wield power far and near; may be in touch with the private secretary across the table, and with the peon dumping slag below the smelter. A recent correspondent remarked that it was impracticable to personally supervise the details of operations, save in a small plant. That is not true. The successful manager is he who wisely delegates authority, and once delegated, never withdraws it, but who does actually know and touch the details and the men, down to the very least.

THE Mexican Government is growing less lenient as time goes on. Not many years ago holders of concessions were granted indulgences with lavish generosity. Today they must perform their obligations or stand aside for those who will. The iron rule applies even to Mr. Harriman, whereby the people may feel that an even chance for all is to be the Mexican policy in future. Mr. Harriman obtained a valuable concession for a railroad down the west coast, through Sonora and Sinaloa, and thence across the mountains through Tepic to the city of Guadalajara. This road, known as the Cananea, Rio Yaqui & Pacific, has been constructed from Guaymas to Culiacán, a distance of 549 miles. The concession was to have expired in 1910. This was extended to 1912. Finally Mr. Harriman sought an additional three years' grace, and the answer from Chapultepec is 'nay!' The result is a sudden increase of activity in railroad-building through one of the finest stretches of virgin territory in North America.

The Lawson Circus.

IT was P. T. Barnum who announced that the world likes to be hoaxed. He had the effrontery to say so in his autobiography which he used to sell outside the circus-tent, while he invited the hoax-loving multitude to pay another fee to enter and see the 'What is it?' and the 'Cardiff giant' which Major Pond had manufactured to turn a desirable penny. Barnum was a true humorist; he set no traps for the unwary; he promised nothing that he failed to deliver; he aroused no hopes that he did not fulfill. But he played on human credulity; he re-discovered that the world was willing to pay for its credulity, which was known as far back as the days of the Delphic oracle and before; he laughed at his dupes openly and then duped them again—for a consideration. Thus he became the prince of showmen, and his memory is held dear enough to excite a certain species of reverence in those who experienced the delectation of gaping at his meaningless 'wonders.' So we feel that Lawson is taking a rather sacred name lightly when he appeals to the shade

of Barnum in support of his recent antics. Barnum never held out the hope that his patrons who paid 50 cents for a ticket of admission would escape with $3.50 in their pockets. The gate-money was gone forever, and there was plenty of pink lemonade, peanuts, and popcorn-balls inside to deplete the reserve-fund of the unwary swain. Barnum never appealed to the ministers—never! He was no pharisee. He knew he was a sinner, and that the ministers would hurl anathema at him the Sunday before he came to town, and urge repentance upon the flock the Sunday after. Barnum never invited the school-teachers. He knew they dared not come. In short, he was just a jolly showman, extending a cordial welcome to all, sure that fun was a good thing, and quite unwilling to spoil it with an ethical dissertation. But Lawson plays upon a complicated and dangerous instrument, which is as the orchestrion of the dance-hall to the homely banjo in the hands of the genial showman of earlier and simpler days. He offers stock in a preposterous corporation with a preposterous capitalization of a billion dollars! He offers it cheap; it will return 700 per cent profit "unless lost in the stock market." Think of Barnum suggesting that you could possibly lose anything! You paid your money and saw the show! That was what you came for. But you don't see the show in Lawson's circus. You merely get harangued *ad infinitum et ad nauseam* as to why the program was changed and why the competitor next door is having all the fun. The pitiful thing about it is that just now Lawson is reaping the aftermath of a field which had been harvested of a crop of righteous indignation against monopoly. It is the class-passion he is exploiting now. The trust is the natural enemy of the people, says Mr. Roosevelt. Down with the trusts! cry the laboring-men. On every hand the protest is made, and then comes Lawson, the tool of the 'system,' depending on the credulity of the people to furnish him with money to pretend to whip the despoilers. The tide that even Roosevelt has not yet succeeded in stemming—forsooth Lawson will convert into controllable force to undo its evil effects. 'Like cures like' is the principle of the homeopaths, but Lawson is administering the medicine in the copious fashion of the old-time bottle-drenching allopaths. We fear the dose is too large. Trinity and Yukon are to be redeemed, along with other stocks of unpleasant memory. It is so preposterous that we marvel that it really is true that the people will pay for all this advertising, but they probably will, because they are just socialistic enough at heart to rejoice in being dominated, and to be afraid of the virility of individual initiative which would protect their independence.

Relation of Placer-Gold to Schists.

GOLD-PLACERS have from time immemorial been assumed to indicate the probable proximity of important veins. This theory has been cherished in the face of preponderant evidence to the contrary, just as the popular superstitious belief in the increase of richness in a vein with depth remains unshaken, although the experience gained from mining has demonstrated the absence of any universal law governing the vertical distribution of metals within a lode. The most striking fact concerning the great gold mines of the world is their disconnection with important placers. As a counterpart to this, the great placer-deposits have seldom been supplemented by discoveries of veins which have developed into rich mines. It is true that in the California 'gold belt' a few properties have been operated at a profit, and to very considerable depths. It is also noteworthy that the gold-content, though low, has been quite remarkably uniform, and has continued practically undiminished as far as exploration has extended downward upon the deposit. The Black Hills of South Dakota afford another example of the same phenomenon. Instances are numerous all over the world. The rich placers of California have been derived from a region of schists and slates enclosing innumerable stringers of quartz, very generally containing gold in small amounts, and often showing nuggets of considerable size. These veins are hard, are not subject to alteration, and are often 'frozen' to the enclosing schist. The mines of the region have been developed where such quartz-masses have been of exceptional size, and where there has been a grouping of many quartz-stringers within a narrow zone. The rich placers have resulted from the erosion of the country, followed by stream-concentration of the detached gold. Such has been the case in California, in the Black Hills, in the famous Chocó of Colombia, in Minas Geraes, Brazil, in the plateau around Cuyabá, Brazil, in Siberia, and in Alaska. In the Yukon Territory Mr. J. B. Tyrrell has made an attempt to approximate the volume of rock from which have been gathered the famous placers of the Klondike district. He shows an erosion, subsequent to the last elevation of the region, from an altitude of 3500 to the present general level of 2600 feet. The removal of these 900 feet of schists, with their multitudinous gold-bearing quartz-stringers, over an area of 800 square miles, represents a volume of 136 cubic miles, equal to 1,600,000,000,000 tons of rock. On the basis of 10,000,000 ounces of gold concentrated into the Klondike placers, Mr. Tyrrell deduces an original average content for the entire mass of eroded schist of only 0.003 grain of gold, equivalent to a value of 0.013 cent per ton. A figure closely approximating this was reached by Teodoro Wolff for the schists from which, in like manner, were derived the rich placers of the Santiago river, in Ecuador.

The occurrence of minute quantities of gold in the marine silts around New Zealand was shown some years ago by Dr. Do[illegible]. Other investigators have proved similar precipitation of gold in shale-forming marine deposits in various parts of the world. The segregation of this gold along with quartz-cementation occurring in later periods, induced by metamorphic processes, explains the very uniform distribution of that metal, while the resistance of the quartz to alteration explains the failure of the gold to be chemically concentrated downward in advance of the erosion of the region. The great gold-veins represent mineralogically complex deposits along fis-

shear-zones, or other lines of small resistance, naturally or chemically. Base and precious metal deposition and alteration proceeds evenly and regularly. Thus the erosion can rarely carry away part of the zone of oxidation of the precious metal leaving behind only the base. These are striking facts, well known to geologists, but not fully appreciated by the investing public or that portion of the public which includes capitalists interested in mining.

A Tariff on Zinc Ores.

News from southwestern Missouri has of late restored a happy state of mind among the miners, which for many months. The zinc producers have suffered heavily from the collapse in prices. There are important new demands for zinc arising from time to time, as happens in the case of every metal, to give sudden stimulus to both price and production. The existence of vast deposits which would enable the zinc corporation to assume a dominant position in the industry is another factor in the zinc situation that, apart from those metals in which speculation seriously influences the market quotations, is unique. Finally, the large number of small deposits which can be worked at a profit has prevented control of the industry by a trust, despite several half-hearted attempts to accomplish such an end. A further interesting feature of the zinc industry is that while many of the few mines have been willing to "custom" upon the production of their own ores, the zinc smelters have been exempt naturally from the conditions explained above. Consequences have been on the one side a close union of the miners and the smelters into a solid phalanx with selfish interests pending over a whole state, and on the other side zinc producers have been less subject to artificial influences than those of any other metal, unless it may be lead. Its price is a far superior measure of prosperity or depression in the business world. Spelter gradually followed the upward sweep of all commodities until 1907, when it touched 6.887 cents per pound. The lessening of demand, as reflected in the price for that month, is interesting in retrospect. The decline was a steep unbroken decline of upwards of a cent a pound, which culminated a trifle in October and sank to 4.25¢ in December. Since then it has risen to 4.83¢, but not above that figure and 4.83 cents. At these prices many mines in the Missouri field have been obliged to close.

In the heyday of booming industry, when the zinc mines were able to sell all the ore they could produce at such prices as had seldom been heard of, it occasioned small concern that large quantities of "calamine" were being imported from Mexico free of duty. This movement began in 1905, and at that time met with a protest from the Missouri miners. The contention of the Eastern smelters that calamine was only a trade name indicating oxidized ores of zinc, both carbonate and silicate, was fully sustained by the Board of General Appraisers. It matters not that modern mineralogists have limited the name to the hydrous silicate, the Board of General Appraisers is empowered with authority in the matter of determining what any merchandise-maker may convey, whatever be his knowledge or mythological grounds. In this case the founded application by mediæval writers of the name of a mythical Phœnician hero to a mineral of zinc proves a theme for either party, and the ancient trade of zinc smelters is entirely in line with the understanding of the term held by the importers of ore. Thus a protective tariff, by inadvertently putting on the free list an antique trade name of rather indefinite signification has thereby actually protected the manufacturer, while the producer of the raw material gets the worst of it. The Mexican ores, entered as 'calamine,' consist mainly of the carbonate, and such oxidized products require no roasting. The consequent saving over the cost of treating the zinc-blende of the Mississippi valley is enough to admit of settling with the Mexican shipper on the basis of five cents for spelter at St. Louis, even when the market quotations are down to 4.5 cents or lower. This circumstance has converted Southwest Missouri into a high-tariff community, and a so-called non-partisan Zinc Ore Tariff Club has been organized and will maintain an active propaganda to educate the people to the need of specific legislation which shall exclude foreign zinc ores of every kind. Meanwhile the producers are still pushing for a reversal of the decision of the Board of General Appraisers by the Supreme Court, and furthermore have been seeking to obtain a classification of zinc-blende by the Treasury Department as "metallic mineral substance in a crude state," within the meaning of the Dingley Act, which would then subject it to a duty of 20 per cent ad valorem. Neither effort to obtain classification favoring the miners is at all likely to succeed. The time-honored usage of the word 'calamine' is in accord with the construction put upon it by the appraisers, and 'metallic' can hardly be construed to usurp the function of the term 'metalliferous.'

The remedy for the miners is manifestly along the lines of new legislation, as proposed by the Zinc Ore Tariff Club. The case is clear and strong. As the law stands the smelter may utilize it to his advantage, which, as a rational being, engaged in business and not in charitable efforts, he steadily and honorably does. If the law shall prohibit importation, then spelter must advance in price, and the consumer must pay the difference. This also is inclusive. It must likewise be reasonable and desirable. High prices for the consumer have made boom times. A protected iron and steel industry, a protected lead industry, a protected leather industry, protected industry, in short, must be excellent, since it has so long met with the endorsement of those who pay for it. But, granting the truth of it, let us at least be consistent and not make times harder by keeping down the price of zinc when a little crumb of a comfortable cent or two would bring so much happiness to Joplin. Seriously, we should be logical. Let us protect, or not protect: one or the other. As the case stands our sympathy goes out to the neglected Missourian.

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Personal.

FRED L. JOHNSTON has gone to Rawhide, Nevada.

CARNEY HARTLEY, of Denver, is at Buffalo, New York.

FRED G. FORESHAW has returned to Barranca, Sonora.

LEO VON ROSENBERG, of New York, was at Butte last week.

W. B. WINSTON, of Goldfield, was in San Francisco this week.

C. L. WRIGHT, of New York, was in San Francisco this week.

E. A. HAGGOTT, of Los Angeles, is in Arizona examining mines.

H. FOSTER BAIN is in Denver and will soon be in San Francisco.

G. C. KAUFMAN, of New York, is in Mexico on professional work.

WILLIAM S. NOYES has gone to Shafter, Texas, for a several weeks' stay.

FRANKLIN W. SMITH has returned to Bisbee, Arizona, from Mexico City.

FOREST BEAMER CALDWELL, of Santa Lucia, Sinaloa, Mexico, is in San Francisco.

W. E. DEFTY has left Mexico for examination work at Breckenridge and Leadville, Colorado.

E. E. CARTER, of Quartzburg, Idaho, has been examining the Lucky Boy mine, near Hailey, Idaho.

ROBERT LINTON, of New York, was in San Francisco this week and left for New York, intending to stop at Salt Lake.

GEORGE W. MAYNARD, of New York, is at Idaho Springs, Colorado, examining mining properties for New York clients.

H. VINCENT WALLACE, of Nogales, Arizona, is making an examination of the mines of the Sonora Copper Co., near Sonora, Mexico.

J. D. HUBBARD, of Chicago, was at Goldfield last week, on business connected with the Goldfield Mines Co., of which he is a director.

W. E. BRUCE, of New York, is at Oroville inspecting dredging operations and securing men for a new dredging field in Colombia, South America.

PETER LACKNER has resigned as general manager and as a director of the Butte & Buxton Mining Co., and Charles Fasel has been appointed to the position of manager.

EMMET D. BOYLE will be at Silver City, Nevada, for the next sixty days, on professional business for the Nevada Gypsum Co. and the New York-Nevada Mining Company.

WILLIAM TEMPLEMAN, Canadian Minister of Mines, has gone from Ottawa to British Columbia, where he will visit the mining centres of the Pacific Coast to study mining conditions.

Engineering Societies.

The fall meeting of the American Institute of Mining Engineers will be held in Birmingham, Ala., beginning Tuesday, September 29. Headquarters will be at the Hotel Hillman. The local arrangements will be in charge of Dr. W. B. Phillips, 507 Brown-Marx Building, Birmingham. At the close of the meeting in Birmingham a special excursion is scheduled, returning by the way of Chattanooga, Ducktown, Cincinnati, Pittsburg, and Philadelphia.

L. VOGELSTEIN & Co., New York, give the following figures of German consumption of foreign copper for the months January to June, 1908:

	Tons.
Imports of copper	82,968
Exports of copper	3,878
Consumption of copper	79,090

The consumption during the same period in 1907 was 55,507 tons. Of the above quantity 76,759 tons were imported from the United States.

Latest Market Reports.

LOCAL METAL PRICES—August 20.

Antimony	12@16c	Quicksilver (flask)	$42.50@43
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.95@ 5.90c	Tin	32@33½c

ANGLO-AMERICAN SHARES.
Cabled from London.

	Aug 13. £. s. d.		Aug. 20. £. s. d.
Camp Bird	0 12 9	ex div.	0 14 9
El Oro	1 6 3		1 8 0
Esperanza	3 11 3		3 5 0
Dolores	1 10 0		1 10 0
Oroville Dredging	0 8 6	ex div.	0 8 6
Stratton's Independence	0 1 0		0 1 0
Tomboy	1 5 0		1 2 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Aug. 7	13.38	4.60	4.75	52⅛
" 8	13.50	4.60	4.75	52
" 9	Sunday.	No market.		
" 10	13.50	4.60	4.75	52
" 11	13.69	4.60	4.73	51⅝
" 12	13.63	4.60	4.73	51¾
" 13	13.63	4.60	4.73	52
" 14	13.63	4 59	4.70	51¼
" 15	13.50	4.59	4.70	51⅛
" 16	Sunday.	No market.		
" 17	13.43	4.59	4.68	51¼
" 18	13.43	4.59	4.68	51⅛
" 19	13.43	4 59	4.68	51⅛
" 20	13.43	4.59	4.68	51⅛

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Aug. 13.	Aug. 20.
Amalgamated Copper	79¾	77½
American Smelting & Refining Co.	97¼	94¾
Boston Copper	12¾	12¾
Butte Coalition	27½	26¾
Cumberland Ely	9⅛	8¾
Dolores	7¼	6¾
El Rayo	2⅜	2½
Giroux	4¼	4⅜
Greene-Cananea	11⅝	11½
Indiana Sonora	5⅛	5⅛
La Rose	5⅝	5 9/16
Miami Copper	10¾	9¾
Nevada Consolidated	14⅞	15⅛
Newhouse	6⅝	6
Nipissing	8¼	9
Ohio Copper	3	3
Tennessee Copper	38⅝	37¼
Utah Copper	44¼	44¼
Yukon	5⅛	4⅞

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, August 20.

Atlanta	$ 30	Laguna	1.22½
Belmont	1.15	Manhattan Con	9
Booth	47	MacNamara	60
Columbia Mtn	26	Midway	43
Combination Fraction	1.40	Montana Tonopah	1.45
Daisy	75	Nevada Hills	1.65
Fairview Eagle	40	Rawhide Queen	65
Florence	3.37½	Sandstorm	30
Gold Bar (Bullfrog)	4	Silver Pick	23
Goldfield Con	6.57½	St. Ives	33
Gold Kewanas	38	Tonopah Extension	83
Great Bend	35	Tonopah of Nevada	7.75
Jim Butler	29	Tramp Con	17
Jumbo Extension	50	West End	66

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES — BOSTON.

	Closing prices. August 20.		Closing prices. August 20.
Adventure	10½	Mass	7⅝
Ahmeek	95	Michigan	13½
Allouez	35½	Mohawk	66
Amalgamated	76⅜	Nevada Con	15⅛
Arcadian	4	North Butte	83¾
Atlantic	14¼	Old Dominion	39½
Bingham Con	60	Osceola	110
Boston Con	12¾	Parrot	27¼
Butte Coalition	27	Phœnix	—
Calumet & Arizona	118	Quincy	94
Calumet & Hecla	685	Rhode Island	4¼
Centennial	33½	Shannon	15
Con. Mercur	43	Superior & Pittsburg	13¼
Copper Range	78	Trinity	19¼
Daly-West	10	United Copper Con	11⅝
Franklin	12½	Utah Copper	—
Granby	102	Victoria	5¼
Greene-Cananea, ctf	11½	Winona	6½
Isle Royale	22½	Wolverine	142

General Mining News.

ARIZONA.

COCHISE COUNTY.

With the completion of the enormous pumps which the Tombstone Con. Co. is now installing on the 1000-ft. level in the Tombstone mines, the pumping equipment there will have a capacity of 10,000,000 gal. every 24 hr.——As a result of the recent visit of the Thibidaux stockholders in the Santa Theresa to their properties, a few miles south of Douglas, the building of a mill is contemplated. Meantime, until this is definitely determined upon, the shipment of ore to the smelter has been discontinued.

GILA COUNTY.

Conditions have improved at the Old Dominion and the cost of producing copper has been considerably reduced, so that with a rising metal market, Old Dominion should soon be in a position to renew the payment of dividends. The regular development work, which includes the sinking of three shafts, was continued last week, and a large tonnage of ore of excellent grade was hoisted. The sulphide ore shipped from Dalton, Cal., is giving very good satisfaction. It runs 48% iron, 28% sulphur, 2.5% copper, and 6% silicate. Five furnaces continue in blast and are turning out about 120,000 lb. of copper every 24 hr. The Company has contracted for a large amount of coke from the Phelps-Dodge ovens at Dawson, New Mexico, and shipments will boon begin to arrive.——The Miami Copper Co. has resumed sinking the Red Springs shaft and is still extending the drifts and cross-cuts on the 470-ft. level and adding to the ore in sight.——The work of cutting the station at 450-ft. level in the Eureka shaft of the Arizona Commercial will soon be finished and connection made with the 900-ft. drift from the Black Hawk incline-shaft. Another 200-hp. boiler has been erected at the Eureka shaft and pipe for the steam column has been received.

MARICOPA COUNTY.

The Octave Gold Mining Co. will build a 650-hp. electric power plant on the Holland land, at Wickenburg. The machinery has been ordered and will arrive within 30 days. In the meantime the buildings are to be built and everything rushed ready for operation. The Octave company will sell a part of the power, using only 500 hp. itself. O. A. Knox will have charge of the construction.

MOHAVE COUNTY.

The new gasoline hoist has been placed on the Golconda mine, in Union basin and the work of sinking below the present level will soon be under way.——It is reported that a sale has been made of the Midnight mine, at Chloride, and that a payment was made tnis week. The Midnight mine is owned by St. Charles Bros., and is said to be one of the largest copper bearing veins in the north part of the Wallapai district.——It is reported that the hoist on the Champion mine, near Cerbat, will be moved to the New London property and used in hoisting ore. The owner, L. D. Godshall, has made arrangements with the Needles smelter to test the ore. The New London and other mines in the same group are among the best silver-gold properties in the State.——J. W. Marshall recently sold one-half interest in his Noonday mining claim, at Chloride, to H. M. Holloway, of Thurman, Iowa. The Noonday is an extension of the old Arastra mine, owned by Steve Smith, and which at one time was a big producer of high-grade ore.

PIMA COUNTY.

A rich strike in the Santa Rita has made it necessary to install a big concentrator, and the machinery is on the ground. The mine is about 46 miles from Tucson and is considered a very rich property.

YUMA COUNTY.

R. P. Felipe Ortez & Ramon Villa have disposed of a one-sixteenth interest in their group of seven claims in the Castle Dome district, for money to be used in developing their very promising prospects.——In Cunningham pass, Tom Carrigan has acquired an interest in a group of eleven claims, giving Walter Fleming and Julius Moreil $10,000 in cash and 150,000 shares in the New Signal Co., which is to take over the holdings.

CALIFORNIA.

CALAVERAS COUNTY.

A report of a rich strike comes from the Saratoga mine, about a mile and a half east of Glencoe. It is said the ore assays over $75 per ton in gold and comes from a vein between two and three feet wide. The property includes a mill-site and water under a 200-ft. head.

MADERA COUNTY.

The Excelsior mine, near Sugar Pine, has been bonded to James E. Conde, of Arastraville, for 18 months, the consideration being $15,000. By the terms of the contract Mr. Conde is to begin work within 60 days and to pay 25% of the gross extraction, which royalty will apply on the purchase price. The Excelsior has a record production of $421,910 from June 13, 1862, to November 25, 1866. The ore was crushed in an eight-stamp mill, the stamps of which weighed only 450 pounds.

NEVADA COUNTY.

(Special Correspondence).—The North Star Mines Co. has purchased a large Plymouth freight automobile to haul supplies to the mines. It is the first of its kind to be used here.——The compressor at the Kenosha mine blew up last Monday, causing a suspension of work at the mine for a few days.——Engineers are surveying the Campbell ditch, which supplies the Blue Point mine with water, and the work of enlarging it will start in a few days.——Several men have been added to the working force at the Brunswick. Conditions are improving in the mine.——The Sweet Briar M. Co. is installing a hoist and other machinery at its property, near North San Juan. Extensive developments are planned.——F. H. DeLanney and associates have bonded the St. Elmo mine to Nevada mining men headed by S. Granger, of Sparks. The property will be worked through the Yankee tunnel. Mr. Granger is superintendent.——Harry Overman has resigned his position as superintendent of the Ancho mine and has been succeeded by Austin H. Hart. Mr. Overman goes to Honduras in the interest of Eastern mining men.——A good body of ore has been struck in the lower adit at the Magnet mine. An air-compressor is being installed to facilitate work on an enlarged scale.

Grass Valley, August 17.

PLACER COUNTY.

Bob Waugh and associates have gone to Canada Hill to do the assessment work on their Knob Hill group of claims.——The management of the Peckham Hill has ordered lumber for a mill and blacksmith shop. The boiler of the Esperanza mine, near Greenwood, has been purchased and will be set up at the Peckham Hill.——Work at the Southern Cross property has been temporarily stopped on account of shortage of water.

SAN BERNARDINO COUNTY.

Work has been started on the 600-ft. adit which H. R. Zintgraff is to drive on the Sundown property, at Hart, recently purchased from Warren Foster. The adit is 6 by 6 ft., and will be rushed with two shifts. It is also planned to sink a 500-ft. shaft.——There has been a decided change at the Hart & Hilt adit during the past week, the soft talcy formation becoming more oxidized, while colors are now obtained in greater quantity than for some time. The unusually soft ground has been penetrated for over 30 ft., and the change now appearing in the face of the tunnel is indicative of the near approach of the orebody.

SAN DIEGO COUNTY.

The Escondido Mine Development Co. has acquired the claims of the Asmus Co., consisting of 120 acres near Escon-

dido, and will begin immediately operating the property. There is already a 22-ft. shaft on the property, and this will be sunk to a greater depth immediately.——J. H. Retcliffe will start work soon on a claim which he owns at the foot of Little Tecarte mountain. A number of Chula Vista men are interested.

SHASTA COUNTY.

The Black Tom Mines Co., owning the famous Niagara mine in the French Gulch district, has begun active operations with a force of about twelve men, which will be added to as fast as places can be made for them. Machinery for a 10-stamp mill has been ordered and will be erected as soon as it can be used. K. H. Seibel will have charge of the plant.——The smelter at Coran is practically complete, except for the concrete foundations of the converters. A large force of men are now rushing that part of the work.——A. J. Mike of the French Gulch district has secured a preliminary injunction against the Dunsic Mining Co. It restrains the Dunsic company from running the tailing of its mill over the plaintiff's placer claims. Damages are alleged to the extent of $10,000.—— The Clear creek dredge, run by Cheney & Co., and constructed last year at a cost of $125,000, was burned to the ground a week ago with an insurance of $40,000. It is to be immediately rebuilt. It is conceded by mining men that know anything about conditions, that the Horsetown gravel beds where this dredge is operating will easily warrant a reconstruction of the dredge.

SIERRA COUNTY.

It is reported that A. M. Bixby has found ore on Lucky creek, only a mile from Forest, which assays over $32,000 per ton in gold.——Robert Duree, of San Francisco, has recently re-located the old Gardner vein, near Poker Flat, and will proceed to prospect the vein as soon as possible. ——The Alaska Mining Co., at Pike City, has recently let a contract to sink its shaft 300 ft. deeper. Oswald & Oats have the contract and are working four shifts.——F. G. Frymire has been appointed superintendent of the Alleghany mine at Balsam Flat, to take the place of W. W. Tiner.

SISKIYOU COUNTY.

The Mammoth Copper Co., of Kennett, Shasta county, has obtained a bond on the Rainbow mine, near Sisson. It has shipped a diamond-drill outfit and will thoroughly prospect that Mt. Eddy property.——The Mt. Eddy Mining Co. has been formed to work the Esmeralda, Buzzard, and Meseppa claims on the east side of Mt. Eddy. Otto L. Haese is in charge of the operations of the new Company. ——G. H. Coffin, Jr., has purchased the Mississippi placer mine on the Klamath river at the mouth of Grider creek and will begin active operations at once.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—One of the richest gold strikes in the history of this district has been made on the Hoery claims, on Alpine Mtn., across the gulch from Griffith Mtn. The discovery was made in the breast of the adit, 350 ft. from the entrance. The ore carries free gold and assays run as high as $15,000 per ton. The streak is from 2 to 3 in. wide, the ground having been opened for 20 ft. Considerable excitement prevails and owners of property in that locality are on the ground prospecting. L. Hoery, of Georgetown, is the owner. The Tol Reynolds, a neighboring claim, is being developed by the owner, H. Davenport. Recently a small streak of gold-bearing rock was found, and from seven pounds that were reduced by an assayer, three buttons worth $60 were obtained. The ore carries free gold and the owner is now driving the adit in the hope of catching a good-sized streak.——A 2-ft. body of ore has been uncovered on the Sporting Times mine, owned and operated by A. H. Colburn. The strike was made in driving on the Sporting Times vein at its junction with the Moore vein. After opening the ground for 25 ft. a crevice 3 ft. wide was showing, while 2 ft. of almost solid mineral is exposed. Lessees at work on the Moore vein are following a streak of smelting ore from 6 to 8 in. wide that mills from $60 to $65 per ton in gold, silver, and lead.——A contract was awarded this week to William Collins for furnishing 400 sets of timbers to be delivered at the Scepter adit, the portal of which is on the Georgetown side of Democrat Mtn. The entire workings are to be placed in condition for starting the development, which is to be put under way at once. The strike made a few weeks ago in the breast of the adit is coming up to expectations. The streak is showing for 80 ft. and is from 6 to 12 in. wide. Stoping has been started and a fair tonnage of ore is being mined. The adit is being driven steadily forward and within 220 ft. the heading will cut directly under the Sunburst workings from which a heavy production was made a few years ago. The Aster-Stewart M. & M. Co., operating this property, has notified all lessees that there will be no renewal with the expiration of their contracts, as it is proposed to do all work on company account. S. McKirahan is resident superintendent.——From 50 to 60 tons of concentrate is being sold weekly by the Burleigh M. & L. Co., operating the Pelican mill under lease. The product is not classed, as it has been found that better results are obtained, the material being worth on an average of $60 per ton. This mill has a capacity of 250 tons for each 24 hours, two tramways being kept in operation in the delivery of the ore to the bins. ——A shipment of five tons of smelting ore was made this week from the lease being operated by Anderson & Co., in the upper workings of the Seven-Thirty, and for six days' work the operators realized the sum of $1940, after paying royalty, smelting, and transportation charges. It is expected that a production of from $15,000 to $18,000 will be made monthly. The drift has been extended for 60 ft., and there remains 72 ft. of ground to be prospected.——R. C. Patterson has taken a lease on the Fairell mill-site and dumps, a short distance above Georgetown. There is a large amount of material available and tests are now being made for the purpose of ascertaining the best method of treatment. Shipments will be started to the various custom mills, and in the event the expected saving of metals is effected, a small concentrating plant is to be constructed.——Work is to be resumed shortly on the Blue Bird group of patented claims, Democrat Mtn. This property was formerly a good producer, but has lain in idleness for over two years. The Blue Bird vein is the eastern extension of the Pay Rock.——Butler & Co. and Miller & Jacobs have sold their leases on the Wheeling vein to the Waldorf Metals Co., which recently took over the majority of the holdings of the Waldorf M. & M. Co. The Waldorf Metals Co. has started work in earnest, and within another week a force of from 60 to 70 men will be at work. D. F. Sprousse is manager.——As soon as the connection between the Seven-Thirty shaft and the raise from the west Phillips drift, of the Burleigh adit, has been made, a number of people holding privileges on the Phillips vein will resume work. Hancock & Co. were compelled to close down owing to interference with the work in the raise, shipments having been in order for more than a year. The orebody is from 2 to 3 ft. wide, a part of which is of a milling grade.——Operations have been started on the Centennial, owned by the Kennedy G. M. Co. The adit is being driven forward and as soon as it is advanced 400 ft. lessees will be offered blocks of ground. Shipments are being maintained from the mine by Ratholz & Co., operating under lease. D. Kennedy, of Georgetown, is manager.

Georgetown, August 15.

OURAY COUNTY.

The Snow Flake is to be re-opened under a lease held by C. W. Kling.——B. B. Slick and W. R. Hyde, of Boise, Idaho, have started work on the ten claims which compose the Sutton group, preparatory to installing a compressed-air plant with which they will drive an adit along the Denver lead and cross-cut to the Sutton.

SAN JUAN COUNTY.

D. E. Carmichael recently secured a bond and lease on

the Esmeralda property, in Maggie gulch. Men will be put to work immediately cleaning out the mine and getting it in condition for active work.——The Contention mill has recently made a test run on a lot of ore from the Champion mine. It is said that if the results are satisfactory a mill will be erected by the Ross M. & M. Co.——The Iowa and the Tiger mines are to be operated by a leasing company composed mainly of Silverton people, headed by Otto Mears. The mill was badly damaged by a snow slide last winter and since then neither the mines nor mill have been operated. Work will be started immediately.

SUMMIT COUNTY.

A. W. Moon, of Denver, is to start work immediately on a new dredging proposition near Breckenridge. He will put a large force of men to work, equip the plant with electricity, and install the latest and most complete machinery. He has obtained some valuable ground, which he says can be worked successfully during all seasons of the year.——Work on the North American and Mary Verna, at Frisco, was resumed this week, after a suspension for a few months. These adits now penetrate the mountain to a distance of about 2000 ft. each.——The Wire Patch Co. is planning to push the lower adit of the mine farther into the hill and build a raise to the upper workings. This would give them enough ore to run their new mill at full capacity. About 30 men are at present employed at the Wire Patch.——The Pennsylvania mine, at Argentine, will build a new mill to replace the one now in use. Electric power from the Summit plant, at Dillon, will be used. W. B. LeWald is manager.

TELLER COUNTY.

E. J. White, who has a lease on the Gold Bond, will make his first shipment soon. The ore is being hoisted through the Sweet shaft.——McCackill and associates, operating on one of the blocks of the Stratton's Independence have opened up a body of high-grade ore. There are several sets of lessees operating on the property, all of whom are in ore and shipping. Four sets of lessees are operating on or near the surface and are mining a smelting grade of ore with small expense. During the month of July about 40 cars were shipped from the property with an everage value of from $35 to $40 per ton.——It is understood that the Copper Mountain cyanide mill, which has been closed for months, is to be started up again and kept in steady operation in the treatment of custom ore from the Fluorine and other Copper Mtn. properties. A. H. Head, representing Chicago and Kansas City parties, is in the district and is getting the plant in shape. The mill, which has a capacity of 100 tons per day, was formerly operated by the Sioux Falls Co.——An orebody of good size has been opened up by Johnson & Co. on the South Clara D. of the Lexington Gold Mining Co. on the west slope of Gold hill at a depth of 85 ft. The newly discovered shoot, which measures three feet between walls, was found in virgin territory and gives assays as high as $100 per ton.——The officers of the Bonnie Nell Merger Gold Mining Co. have decided to resume operations on the holdings of the property, which comprise 26 acres on Raven hill. A contract has been given to Dave Roberts for cleaning up the workings and re-timbering the upper portion of the shaft. A complete electric hoisting and compressing plant will be installed and active operations started at once.

IDAHO.

LATAH COUNTY.

The Mountain Gulch Mining Co., in the Hoodoo district, will purchase a 20-ton Card table, an ore crusher, boilers, and other small machinery. Work on the incline shaft is progressing rapidly.——R. H. Kemp, of Spokane, and associates have located some claims 15 miles south of Harvard, in bottom lands of the North Palouse river. A great deal of prospecting has been done in this vicinity, and it is believed that the vein, from which so much float has come, has finally been found.

IDAHO COUNTY.

The new Meadow Creek mill was completed last week and is now treating ore at the rate of 25 tons per day.——The 24-stamp mill at the Jumbo mine is making a test run on ore from Del Rio mine, with a view to leasing the mill to the latter company. The adit at the Del Rio mine is in 900 ft. and has cut an orebody which is 15 ft. wide.

SHOSHONE COUNTY.

(Special Correspondence).—Destruction of timber and buildings of the smaller outlying prospects by forest fires has been the principal feature of the mining industry during the past week. While in no case has the damage been really serious, nevertheless much inconvenience and a considerable number of scares have been caused. During the past week no less than five forest fires have been raging in different parts of the district, and not all of these are yet under control.——A strike of several feet of lead-silver ore has been made in the property of the Enterprise mine, near Wardner, owned solely by Fred Donaldson. The claims were located about five years ago, and a considerable amount of development has been done. The recent strike was made in a winze sunk from the end of the adit, and at a depth of only about 100 ft. Assays run all the way from $8 to $40 in lead and silver.——The Idora Mining Co. paid up at the beginning of the week the mortgage against its property given to Walter J. Nicholls of Spokane for the sum of $12,000. The whole of the amount was derived from the sale of treasury stock and was the last payment on the indebtedness of the company, incurred during the financial depression of last year. This is regarded by many as the most promising prospect in the district.——The Federal Mining & Smelting Co. will soon resume work on the Corrigan group of claims, near Wardner, which have been closed down ever since the recent metal depression.——Twelve feet of high-grade shipping ore has been struck in the upper workings of the Surprise Mining Co., at Wardner. Beyond the fact that the strike was quite unlooked-for, no details have yet come to hand. The ore is said to be of the highest grade yet struck in the district.——A new concentrating table, the invention of Charles B. Walker, of Joplin, Mo., and known as the Coulee concentrator, is about to be tested at the Morning mine, at Mullan. The inventor of the table is now in Wallace, and claims that the new apparatus will save 98% of the metal-content. Two of the great differences between this table and those usually in use are in the driving device and the riffles. It is driven with a double cam-gear, and there are no toggle-joints with which to make adjustments. The riffles and deck are made in one solid piece from boiled cypress.——A meeting of the stockholders of the Montana-Standard Mining Co. was held at the beginning of the week, and the old directors were re-elected. A considerable amount of discussion took place with regard to the advisability of erecting a mill at once, but it was ultimately decided to run a 700-ft. drift first. Three ore-shoots have already been exposed in the property, and there are over 1000 ft. of stoping that can be commenced as soon as a mill is in operation.——The first shipment of ore is about to be made from the property of the Panhandle Mining Co., operating the claim of that name owned by the Pittsburg Lead Mining Co. This ore will be sent to the smelter at Salt Lake, and will be followed by further shipments at regular intervals. The ore runs about $40 in lead and 30 oz. silver. At the bottom of a 70-ft. shaft 2 ft. of good shipping ore has been found, with about 4 or 5 ft. of concentrating ore. An adit is being run to get under this ore at depth.

Wallace, August 15.

NEVADA.

ESMERALDA COUNTY.

An extension of four months, carrying the tenure to September 1, 1909, has been granted to the Hazel Goldfield Co., which is leasing on the Last Chance claim of the Laguna.——Arrangements have been made by the leading shareholders of the Goldfield Oro to amply finance that Company. Extensive work will be carried on by lessees,

on company account, or both.——Block 4 on Combination No. 2 has been leased by the Goldfield Con. Mines Co. to Jack Davis. This block was formerly leased to Oscar J. Smith, but it forfeited to the Company because of lack of development work done.——The work of installing the new hoisting plant at the collar of the main working shaft of the Grutt Hill Mint Co., at Rawhide, is practically completed. As soon as the machinery is in operation the shaft will be lowered another 100 ft., from which point cross-cuts will be run out to the orebody.——Work has been suspended at the Big Four lease of the Manhattan Con. Mines Co., at Rawhide, owing to refusal on the part of the management to establish a semi-monthly pay day, in accordance with the rules of the local miners' union. ——Compressed-air has been substituted for electricity in the new hoist on the Mohawk. The Claremont shaft is down 395 ft. and is expected to strike the Mohawk vein at a depth of 850 ft.——The mines of Goldfield produced during the week ending August 15 a total of 2544 tons of an estimated value of $245,190. During the same period the Tonopah mines produced 5980 tons of an estimated value of $157,550.

LYON COUNTY.

The Mountain View group of mining claims, near Yerington, has been bonded by California capitalists for $100,000, the same parties taking an option on the Red Crag group for $20,000.——The Nevada-Mammoth Gold Mines Co. will erect a 50-ton mill at its mill-site near the Gignoux ranch-house. The Company is now sinking an incline shaft on its Cambridge vein and at a depth of 80 ft. has found ore which assays over $75 per ton in gold and silver. On another claim there is an incline shaft 350 ft. deep with levels at each 100-ft. point. This and other properties are in shape to attract attention once more to the old Cambridge district. F. H. Meyers is manager of the Nevada-Mammoth and the office of the Company is at Yerington.——A carload of machinery arrived last week at Wabuska for the Kennedy Consolidated in the Buckskin district. This car included only the hoist and mining machinery, but a mill has been purchased and will probably be running before the first of next year.

NYE COUNTY.

The Huntington mill is being placed at the Bullfrog Pioneer and the management thinks the 50-ton cyanide plant will be ready for operation the first of next week. ——The largest gold brick as yet made at the Keane Wonder was deposited last week with the First National Bank of Rhyolite by Homer Wilson. It weighed 700 oz. troy, and was worth about $16 per ounce, giving the bullion a value of $11,000.——The old camp of Gold Reef is again attracting attention. A report comes this week of a strike of $300 ore on the Kris Kringle claim, belonging to Dougherty & Fleming. The ore was found at a depth of 350 ft., and carries some free gold.——The Pennsylvania-Tonopah G. M. Co. has purchased a hoist and will at once start sinking on its ground adjoining the Ohio Tonopah Extension.

WHITE PINE COUNTY.

The first shipment of copper from the big plant of the Steptoe Valley Smelting & Mining Co. was made last week and consisted of two carloads of 36 tons each billed to New York City. The Veteran mine is installing a complete fire protection system for its surface buildings, with a storage capacity of 20,000 gal.—James Tucker and associates have started a force of four men at work on a 200-ft. shaft at their Knife & Fork group of lead claims west of Cherry Creek.——Rieppetown, a small camp near Ely, was completely destroyed by fire last week. The carelessness of a janitor in lighting a match near a gasoline can was the cause of the fire.

UTAH.

JUAB COUNTY.

The directors of the Uncle Sam Mining Co. declared a dividend of 5c. per share, which makes the total amount distributed $25,000. The dividend is payable August 20. Uncle Sam is the second Tintic mine to resume the payment of dividends, the May Day having made a distribution over two months ago.——It is believed that the old Picnic company, whose claims embrace a part of the Silver City townsite, will resume operations in the near future. ——The shaft of the McKinley Mining Co. has reached a depth of 500 ft. and two drifts have been started to fully explore that horizon.——The directors of the Colorado Mining Co. have declared a 12c. dividend.——The ore-shipments from the mines of Tintic for the week ending August 14 were 111 carloads. The shipments to the new Tintic smelter during the same period amounted to 19 carloads. It is claimed that the smelter will not be blown in for at least two weeks yet.

SALT LAKE COUNTY.

The management of the Silver Shield mine at Bingham Canyon has recently let a contract for a new 300-ton ore-bin at the Silver Shield mine and has purchased another mine locomotive.——It is believed that the Ohio Copper Co. will soon resume the construction of its concentrating mill at Lark. James MacFarlane has been made managing director of the Company.——The Yampa Smelting Co. last week started its smelter at Bingham canyon. The plant has been completely overhauled and two new reverberatory furnaces and six McDougal roasters added. A new chimney and dust chambers also make the plant more economical in operation.

WASHINGTON.

CHELAN COUNTY.

The Chelan Butte Gold Mining Co., with a capital stock of $1,000,000, has been organized at Chelan, and a contract has been awarded to E. Cross, of Chelan, to run a cross-cut tunnel of 300 ft., which will tap the vein 200 ft. below the point where the ore is being taken out. M. M. Kingman and Al Pershall are at the head of the Company. The properties include the Butte, the Little Butte, Columbia, and the Dakota on Lake Chelan.

FERRY COUNTY.

(Special Correspondence).—The lessees of the Republic mine have shipped the third carload of ore to the Granby smelter, at Grand Forks, B. C., and are getting ready for the fourth shipment.——Work has been resumed in the Lucile Dreyfus mine, near Danville, with three men, under Theodore Petterson, as superintendent. This mine has been closed down three or four years because of internal strife among the stockholders, brought about by fraudulent issue of stock by the former secretary. Workings to the depth of about 200 ft. resulted in opening an immense body of iron sulphide ore, which assays well in gold and some copper. A shaft, down 125 ft. below the adit level and the bottom workings, were operated with use of a whim. It is reported that the Company contemplates installing new machinery.——The Knob Hill M. & M. Co. has shipped a carload of $40 gold-bearing ore to the Granby smelter. A compressor plant has been purchased and will be used in driving a long adit. S. L. Boyer is the manager.——Thomas L. & Wilbur D. Greenough and associates have taken a bond on a group of claims on Huckleberry Mtn., near Laurier, and will incorporate under the name of the Laurier Mining Co. They will start work on an adit, to cross-cut the vein at a depth of 225 ft. Three shifts will be employed. The vein on the property is said to be over 100 ft. wide and traceable for more than 3000 ft. The present workings are three open cuts, a shaft, 50 ft. deep, with a cross-cut from its bottom. The Spokane Falls & Northern railway crosses a part of the group not over 1000 ft. from the point where the adit will be started.——The Columbia river is to be opened for transportation between Wenatchee and the mouth of the Sans Poil river, to accommodate the Keller & Indiana S. & D. Co., leaving only six miles of wagon haulage for coke between the Columbia river and the K. & I. smelter. It is estimated that it will require the constant service of a small steamer, now being built, to keep the smelter stocked with fuel. The Company hopes

to begin smelting about September 1. Several small mines in the Keller district are awaiting this for the sale of ore. ——It is reported that the Colville M. & S. Co. will in the near future spend considerable money in its South Half group of claims and smelting plant at Park City. G. Weaver Loper, the manager, has recently returned from New York, where he attended to the financial arrangements.

Republic, August 15.

PHILIPPINE ISLANDS.

(Special Correspondence).—Benguet's gold production is steadily increasing and the clean-ups for June show a total of 13,100 pesos, the greatest of any previous month. This is from two mills: the Bua producing 5600 pesos with its six-stamp mill and cyanide plant; and the Benguet Con., or Clarke mine, 7500 pesos. The Clarke output fell a little below normal, owing to the rainy season starting with heavy storms which raised the surface water, flooding the first level below the mill adit. Heretofore all ore has been coming from development work alone, but this necessitated stoping odd remnants of blocks near the surface. The storms also stopped work on the low-level drainage adit, which is now about half way through the lead, showing five feet of $12 ore on the hanging wall. The Bua Co. made a large increase in output, but operated only 24 days, owing to tram line being washed out during first few days of the month. This Company is now being reorganized and six more quadruple-discharge stamps have

Philippine Islands.

been ordered by cable so as to double the capacity of the mill. T. C. Kinney, the leading spirit of the Company, is now returning from Hong Kong, having successfully floated a small block of the new stock to pay for the mill enlargement and start more extensive mine development. The mill is now running on Gomoc ore entirely.——The Camote mill was closed down practically all the month. It has been sold to local and Manila parties, who have not yet definitely organized a company, but have closed down the mill to put in a large water wheel and more stamps. ——The Copper King mill, so long closed down on account of shortage of water, is now running to full capacity, but has not yet made a clean-up. All ore is being taken from a vein 50 ft. to the west and parallel to the main Copper King vein.——The latest mining venture to be launched here is the incorporation of the Headwater Mining Co., the stock of which was practically all subscribed in Hong Kong. The Headwaters property is on the headwaters of Antimok river, above the Clarke. It consists of 12 claims or about 250 acres. Another mill is soon to be built by the Major Mining Co., one of the latest companies to enter these fields. Fifty tons of ore averaging $12 to $15 per ton is being broken by Igorotes miners, and stored on the dumps ready for milling. Just as soon as there is enough ore on the dumps to pay for a stamp-mill, and in addition furnish it with a year's supply, a mill will be installed. Water for milling purposes will be obtained from adjacent gulches. Power will be generated by a hydro-electric plant on Gold creek, on one of the lower undeveloped claims. This creek runs 500 miner's inches of water in the dry season. The Copper King vein crosses four of these claims, which lie east of the Ascention group and about six miles southeast of Baguio. Seven main veins running east and west and dipping south are being developed. Four of these are on the Electrician claim and two on the Engineer. Shoots of ore are formed where these intersect the Copper King. Most of the veins carry no silver, and only shows manganese and calcite. The present workings have 800 to 900 ft. of 'backs' and all the claims are covered with fine pine timber. The Company is composed of Army officials, and operations are in charge of Mr. Hurlbert, the wireless expert and inventor.——Mr. Hanley, an expert, representing the United States Smelting, Refining & Mining Co., who has been here for the past eight months looking up mining properties, recently returned to the States with an option on the eastern property of Masbate, at a million pesos. He says this country has a bright future before it, and that he will surely return soon. He was unsuccessful in getting options on the larger adjoining producers.

Baguio, July 10.

MEXICO.

The Barranca Mines, Ltd., with mines at La Barranca, Sonora, will erect a 50-ton concentrating and cyanide mill during the coming winter.——The Sonora Copper Co., Noria, Son., will install a reduction plant. An important strike was recently made on the 700-ft. level of the Cobre Grande mine of this Company.——Lignite coal of good quality has been discovered in Jalisco at Zapotiltic, a station on the Zapotlan branch of the Central. An area of 6000 acres is said to be coal-bearing, and during the last five months extensive investigations of the field have been made by the representatives of the house of Garza Galan of Monterey, N. L.——The new mill of the San Rafael mine, at Pachuca, will be completed in a few months. The equipment consists of 40 stamps of 1200 lb. The pulp from the stamps is to be re-ground, after classification, in three Krupp tube-mills, and thence fed through settlers to Brown air-agitation tanks for cyaniding. The battery fluid will be cyanide solution, which will be increased in strength in the Brown tanks. Space has been left for concentrators, but tests indicate that this treatment step will not be needed, as a good extraction is obtained in short time with air-agitation. From the Brown tanks the pulp will be conveyed to two separate units of Moore filter of 150 tons capacity. From these filters, where the slime and fine sand will be thoroughly wasted, the pulp will be discharged to the dump. E. Girault is the manager.——The Guanacevi Tunnel Co., Guanacevi, Dgo., is planning to install a large power and machinery plant, with air-compressor, soon.

Special Correspondence.

LONDON.

Retirement of Prof. Gowland from Royal School of Mines. — Litigation over Flotation Processes.

In some of the London papers several references have recently been made to the approaching retirement of Prof. William Gowland from the chair of metallurgy at the Royal School of Mines. The actual reasons for the retirement have not been given, and, instead, a considerable amount of mystery has been mustered up in connection with it. The fact is that the appointment, being a Government one, is subject to the age limit, that is to say, to the "too-old-at-sixty" theory. In certain departments all appointments become automatically void when the age of sixty is reached. In some cases an extension of time is given, and the limit made sixty-five instead of sixty. This rule is all very well in its way, but occasionally it becomes ridiculous when public men in the height of their usefulness are mechanically dethroned. Examples of this are to be found in the cases of Prof. Ray Lankester, who had to quit the directorship of the Natural History Museum, and of Sir Caspar Purdon Clarke, who, when the South Kensington Museum no longer wanted him on account of his age, was promptly snapped up as a treasure by the New York Art Museum. Now it is Prof. Gowland who has had to obey this automatic rule. I believe that the Board of Education would have given him an extension of time, but for the fact that the School is approaching its reconstruction under the Imperial College of Technology. It was felt that it would be best to allow the new professor to be responsible for the re-organization of his department, instead of the professor who would have to retire before long in any case. Thus it comes that 'our dear professor,' as he is properly called, will terminate his duties at the end of the session in June 1909. Before long we shall see the public announcement inviting applications for the post. The duties will have to be taken up in April of next year. The applicants will have to be British subjects, School of Mines or college men, and must have gained experience by having been directors of metallurgical operations.

As is pretty well known by those interested in ore-concentration by the flotation processes, there is litigation going on between the owners of the Elmore patents and the owners of the Sulman-Picard-Ballot patents. To give a complete account of the matters in dispute would occupy too much space, and few would care to read the full details. The first flotation patent was that taken out by Frank Elmore in 1898. This covered the old oil concentration-process. There were earlier patents taken out in England and the United States for separating metals and sulphides from gangue by means of oil, and in fact the selective action of oil on metallic-surfaced particles has been known from time immemorial. In these earlier patents the ore was kneaded in the form of a paste and water was used for washing out the gangue. Frank Elmore was the first to use water and oil in bulk and make with the ore what may be called a freely flowing pulp. This is what the Elmore companies claim as the master patent of all flotation-processes, holding that all processes using however little or much oil, together with acid and air bubbles or otherwise, are infringements of their primary idea.

The Sulman-Picard-Ballot process is claimed to be quite independent by the inventors and that it is in effect an improvement on the Cattermole process. Smaller amounts of oil and acid are used, and bubbles of gas are introduced by beating or by chemical reaction in order to increase the buoyancy of the metallic particles. In a judgment given by Justice Neville the Sulman-Picard-Ballot patent No. 7803 of 1905 was held not to be an infringement of the Elmore oil patents No. 21948 of 1898, and No. 6519 of 1901. The Elmore people are lodging an appeal against this judgment, and the case will no doubt eventually find its way to the House of Lords.

The matter is complicated by another lawsuit which covers somewhat the same ground, but assumes a different point of view. When the Elmore patent of 1898 was first attracting attention, Mr. Ballot and others approached the Elmores with a view to acquiring the Australian patents. Before purchasing, Mr. Ballot and his friends wished to conduct tests to see if the process was workable. An agreement was drawn up to the effect that they might have the run of the Elmore works, provided any improvements made or suggested in the course of the tests should belong to the Elmores. Messrs. Sulman & Picard conducted the tests, but eventually abandoned them and the patents were not purchased. Subsequently Mr. Ballot and Messrs. Sulman & Picard took out their 1905 patent, and bought the Cattermole and other patents. Their contention is that they abandoned the Elmore process and took up tne Cattermole instead. They claim that their patent is not based in any way on the Elmore, and that not only are they not infringing the Elmore patents, but that their process cannot be considered an improvement on the Elmore process in the light of the above mentioned agreement. This difference of opinion as to the scope of the agreement is the basis of the other lawsuit. The matter has already been tried, but the court of appeal has ordered a re-trial.

In addition to these two lawsuits, there will be more before long. If the patent of 1898 is finally upheld to be master of that of 1905 in point of infringement, it will be attacked by the Ballot party on the score of utility, the argument being that it has never succeeded in practice. Then there will be a lawsuit in which the Ballot party will attack the validity of the more recent vacuum process of the Elmores, contending that it is an infringement of their 1905 patent. The 1905 patent will have to prove its utility also, and the owners are now devoting special attention to this point. It will be remembered that the Zinc Corporation only recently tried it, and threw it out, in favor of the Elmore Vacuum process. Since then the Minerals Separation (the syndicate which owns the Sulman-Picard-Ballot process) has started to work dump-ores at Broken Hill on its own account. This question of utility is a difficult one to treat, for it all depends on the meaning of the word. A process may work admirably according to the specification, and yet not be of commercial utility, owing to unfavorable economic circumstances; while another process may only partially fulfill its inventor's claims and yet, through its more favorable situation, give some sort of commercial profit. Also the mere abandonment of a process is no proof of its inutility, for it may be caused by the introduction of improved ideas.

I have not mentioned the Delprat & Potter processes which use acid without oil, for these do not come within the scope of the present litigation. One of these days when we know more about the theory of flotation processes, we may find that it is the accidental presence of oil in the acid waters of these two processes that gives rise to no small part of their efficiency. The processes are operated at high temperature, and the water from the condensers of the steam engines are used. I should not be at all surprised if eventually it be found that the lubricating oil of the engines plays an important part in the flotation vats.

TORONTO, CANADA.

Ore Shipments from Cobalt Increasing. — New Shaft on Temiskaming Mine. — Discovery on Crown Reserve. — Developments on Montreal River.— Reconstruction at Crows Nest Pass. — Leases Offered at Cobalt.

The continuance of heavy ore and concentrate shipments from Cobalt has at last begun to have its effect upon the stock market, which after having been extremely dull during some weeks, is again active, with a strong upward tendency as regards the principal producing mines, Nipissing and La Rose being the leaders. The July shipments broke all records, with a total of 2584 tons, being 60%

above those of June last and 50% more than the figures for June, 1907, the banner mid-summer month of that year. The total shipments for the first seven months of the present year are approximately 11,728 tons, as compared with 7796 for the corresponding period of 1907. The shipping mines for July were as follows:

Mine.	Pounds.
La Rose	1,028,880
Nipissing	727,707
O'Brien	725,697
McKinley-Darragh	403,980
Tretheway	400,070
Silver Queen	245,000
Nancy Helen	227,007
Right of Way	238,330
City of Cobalt	212,730
Drummond	172,020
Watts	114,810
Cobalt Lake	95,228
Coniagas	82,590
Buffalo	63,560
Silver Leaf	61,410
Kerr Lake	60,674
Hudson Bay	60,000
Townsite	45,600
Crown Reserve	44,000
Peterson Lake	41,237
Nova Scotia	40,230
Cobalt Central	37,440
Temiskaming	40,000
Total	5,168,200

Some of the largest shippers are likely to considerably increase their outputs. With this view the Temsikaming is sinking a three-compartment shaft, to facilitate the handling of the ore. At the Tretheway a rock-crusher has been installed and more machinery is being put in, which is expected to double the yield, in addition to enabling the company to ship a better grade of ore. The University mine, formerly a heavy shipper, operations on which were discontinued for some time before the merger with the La Rose, will soon be producing on a large scale. A force of men is now busy on preliminary work. A statement of the production and earnings of the La Rose for the two months of June and July gives a total output of 743 tons, carrying 501,286 oz. silver, valued at $210,196. Several important discoveries have recently been made. The Crown Reserve has struck what is believed to be the main big vein, at 100-ft. depth, in a cross-cut 20 ft. from the main shaft. Its width at this point has not been ascertained, but it is apparently equal to that in the open cut 190 ft. to the west, which shows 36 in. and has yielded much rich ore. Two nuggets of about 100 lb. each have been extracted from the cross-cut. At the La Rose a strike has been made in the North adit, 140 ft. from the face of the cliff. It is stated that high-grade ore 3 ft. wide was found. This is regarded as significant, as it is the farthest point north at which work has been done on the property. Other rich discoveries have been made on the Right of Way, and on a leasehold worked by the Cobalt Central.

Development in James and Smyth townships on the Montreal river is proceeding but slowly, and though numerous discoveries have undoubtedly been made, the expectations of those who hoped to see a large camp spring up, possibly rivaling Cobalt, have thus far been unrealized. This is largely attributable to the fact that these properties are in the hands of prospectors who have not the means to develop them, and cannot in the present state of the money market produce funds, and will not sell to those who would be willing to operate them, except at prices which are regarded as exorbitant.

The directors of the Crow's Nest Pass Coal Co. at a meeting held in Toronto on August 7, authorized President George G. S. Lindsey, now at Fernie, B. C., to proceed at once with the reconstruction of the portions of the Company's plant which had been destroyed by fire. It was estimated that the net cost would be in the neighborhood of $50,000. The fire destroyed the hospital, and did much damage to the coke-oven plant and other equipment, the total loss to the Company being placed at about $200,000, covered by insurance to the extent of $150,000. The work of rebuilding will be started immediately. Coal mining has been resumed, and it is expected that the normal output will be reached within a week.

The Ontario Government has called for tenders for three mining leases in Cobalt town, including the Nation grounds and adjoining rights-of-way, and four townsite lots, with rights under adjoining streets. The tenders will be opened September 16. The leases will be subject to a 25% royalty on the gross value of the output.

ROSSLAND, BRITISH COLUMBIA.

Centre Star Earnings. — Low Costs at Granby. — Improved Plant for Dominion Copper Co. — Shortage of Coke Following Fire at Fernie.—Slocan District.

The year 1908 has so far been a profitable season for the Rossland mines and, as the outlook for copper is bright, better earnings are anticipated for the remainder of the year. The Centre Star group of the Consolidated Mining & Smelting Co. of Canada is earning a net profit of approximately $40,000 per month on its operations; the Le Roi Mining Co. is not shipping as heavily and, of course, is not making as much money, and while the Le Roi No. 2, Ltd., is shipping only about 2000 tons of ore per month, a higher grade product is going to the smelter than from either of the two first mentioned mines, and the fact that this company already paid four shillings in dividends this year is evidence that it is earning a profit.

Seven of the smaller mines now under lease have made small shipments of rich ore, but the quantity of ore they have sent to the smelters has not been as great as was expected earlier in the year. The lessees of the Evening Star and Blue Bird mines have fared well, and have made money on the venture, but the other properties have little more than paid expenses. The Granby mines are producing steadily about 22,000 tons of ore per week, and are making copper at the Grand Forks smelter for 8½c. per lb. The B. C. Copper Co. is mining and smelting 13,500 tons of copper-gold ore per week and is making copper and landing it in the East for 9¾c. per lb. The Dominion Copper Co. is running only the big furnace at the Boundary Falls smelter, and is treating about 650 tons of ore per day. This Company is at present shipping from the Brooklyn, Rawhide, and Sunset mines at the rate of 4000 tons per week, and is bringing in 200 tons of ore, high in iron, from the Athelstan and Mountain Rose mines for fluxing purposes. The Dominion Copper Co. is installing important improvements for handling ore economically at the mines, and at its two small furnaces, and until these facilities are installed they will not get their cost of making copper down to the low point now reached by many operators. A large new body of ore has been disclosed in the Brooklyn mine, carrying $4.50 in gold, 50c. in silver, and 2.2% copper. Shipments are now being made from this mine.

Just at this time when the Consolidated Co. was going to re-open the Snowshoe, and the district is looking more prosperous than it ever has in the past, a calamity in the Crows Nest Pass coal country threatens to cut off the Boundary coke supply. A devastating forest fire has destroyed the town of Fernie and crippled the coke-making industry of that district. Of late the several hundred tons of coke consumed daily in the Boundary furnaces has come entirely from the Crows Nest ovens. The Granby Co. is making extensive repairs to its smelting apparatus, and now has several furnaces out of commission so that emergency supply of coke will no doubt carry this concern over several weeks. The B. C. Copper Co. also has about three weeks' supply of coke on hand; but the Dominion Copper Co. has only about a week's supply of this commodity in its bins. It is anticipated, however, that the

coal company will get new slack-bins and trestles to the coke-ovens erected within the next ten days, and that coke-shipments to the smelters will be resumed in a couple of weeks. If there is a much greater delay than this it is likely that the Consolidated smelter at Trail, and the Le Roi smelter at Northport, will have to shut down.

The Vancouver group of mines, which the Le Roi No. 2, Ltd., has had under bond, situated in the Slocan district, has been taken over by a London development company known as the Van-Roi Mining Co. The capital of the new company is £34,500, divided into 30,000 preferred shares of £1 each, and 90,000 shares, common, of 1s. each. The stock issue has all been subscribed. The Vancouver group has a promising future before it.

MEXICO.

Call for Opinions on Mining-Law Revision. — Fuel-Oil Contract for Greene-Cananea Co.—Activity Around Nacozari.— Cerro Colorado Co. Plans New Mill. — New Plant for Frontal Mine, Tepic. —Water-Power Project at Choix, Sinaloa.—Recovery of Faulted Vein at Esperanza Mine, El Oro.

The Chamber of Mines of Mexico, through its president, José Luis Riqueña, has issued a circular asking for bona fide expressions of opinion by persons of prominence here and abroad upon the proposed new articles in revision of the mining law, and for information regarding "negotiations for the purchase of mines or for the organization of foreign companies for that purpose that have been suspended through fear that such a bill will be passed."

Part of Northwestern Mexico.

Since the starting up of the Greene-Cananea Copper Co.'s smelter last month good news of important work seems to be pouring in, not only from Cananea, but also from all parts of the State of Sonora. One of the most important new departures is the bringing of fuel-oil to Cananea for the Greene-Cananea company from Texas and Oklahoma. L. D. Ricketts, president and general manager of the Greene-Cananea, has contracted for 1,000,000 bbl., to be delivered in two and one-half years, at the rate of 150 to 200 cars per month. Under the concession from the Mexican Government this comes in free of duty, and will admit of a great saving in the operation of the Cananea plant. At Nacozari the Moctezuma Co. is increasing its production. Twelve miles west from Nacozari the Dawson Gold Mining & Milling Co. has bought the Creston de Oro mines, and has installed a 30-stamp mill with plates and concentrators. At Magdalena the Black Mountain Mining Co. has installed the new machinery for its electric power plant, and it may be expected that that company's production will soon be materially increased. The Cerro Colorado Mining Co., operating in the Altar district, 60 miles west of Magdalena, where it has some 145 acres, or practically a whole mountain, of quartz-porphyry running about $5 per ton, and for which records show that enormous sums have been taken from the richest pockets, is planning an enlargement of plant to handle more economically its immense bodies of low-grade ore. The Industrial Mining Co., at Carbo, Sonora, is developing a good body of lead ore, and the Douglas Copper Co., now operating its smelting plant at Fundicion has already become an important institution to the producers in that part of the State. At the Frontal mine, operated by the Cambio Gold Mining Co., of Cincinnati, and situated in the Rosa Morada district of the Territory of Tepic, a 35-ton concentrating mill has been completed, but the cyanide plant will not be added until the end of this year or first of next, the tailing being stored in the meantime. In the State of Sinaloa it is understood that the Tri-State Development Co., made up largely of English capital, and in part a subsidiary company of the Kansas City, Mexico & Orient Railway, has taken over the concession of the late J. F. O'Gorman for 15,000 hp. on the Fuerte river at kilometre 184, east from the port of Topolobampo, and will establish a hydro-electric power-plant at that point with the idea of providing electric power for consumers along the line of the railway through to Choix, and possibly as far east as Urique, in western Chihuahua.

In the camp of El Oro, State of Mexico, the four principal producers continue to have a combined production of ₱1,600,000 monthly, of which ₱700,000 is net profit. Of these four, one is the Esperanza Mining Co., controlled by the Guggenheims. It is now understood that the recently reported strike in that mine, which caused a rise in the price of stock, was the finding by the diamond-drill of the faulted portion of the rich sulphide vein which had been lost some months before, and which the company was beginning to despair of finding again. Efforts are being made to re-organize the Chihuahua Mining Co., controlled by John H. Kirby, the latest plan being to take up additional ground of Mr. Kirby's, re-organize under the name of La Reina y Anexas, with ₱200,000 capital, of which one-half shall go to Mr. Kirby for his interests, and the other half to raise capital for development purposes, with preference shown to the stockholders of the old Chihuahua Mining Co., who will receive also from Mr. Kirby a bonus of 10% of their purchases. The English company that had an option on the Victoria y Anexas at ₱200 per share, or ₱270,000, has allowed the time to elapse without exercising its right to purchase through fear of the new mining law. The Victoria will continue its own development work. The recent work of the Dos Estrellas on the Victoria gives great promise for the latter.

JOPLIN, MISSOURI.

Organization of Zinc Ore Tariff Club. — Importations of Zinc-Ore from Mexico. — Ruling as to Meaning of 'Calamine' — Limiting Missouri Zinc Output.

During the past month a movement has crystallized to exert every effort to place a tariff upon zinc ores imported into this country. This movement has been started in Joplin by the calling of a meeting of the leading zinc producers, who promptly organized a working body called the Zinc Ore Tariff Club for the purpose of amalgamating the different interests in the district into a harmonious whole whose sole object would be to secure the passage of a tariff act for the protection of American zinc producers. The club is organized upon a non-partisan basis, and the present object is to educate the people of the zinc-producing camps as to the peril from outside competition,

and then presenting the matter with strong endorsement before the ways and means committee of Congress, which will meet soon for the purpose of revising the tariff schedules.

The organization consists of a central body of which there is a president, vice president, and secretary, and a board of directors. The first three offices are elective by the whole district. The directors consist of five men appointed by the president, and the chairmen of each of the local clubs in the different camps of the entire district. There were appointed at first five directors, and these, with the president and secretary, constituted a committee which had in charge the formation of other clubs in the other camps of the district. So far there have been organized, in addition to the central body, a club at Joplin, Webb City, and Carterville.

The club is vigorously spreading knowledge as to the importation of zinc ores. It apears that since 1905 the importation of zinc ores from both Mexico and British Columbia has increased heavily, until some of the smelters boast of using no ore whatever from Joplin. In 1905, when the first important shipments were made from Mexico, the total tonnage was but 30,000, consisting chiefly of silicates and carbonates, zinc-blende being almost a negligible quantity. In 1906, 90,000 tons of ore was shipped into this country, and in 1907 importations reached 130,000 tons. In 1908 the shipments have not been so heavy,

Part of Butte, Montana.

owing to the low price of the metal, the minimum price for which is 5c. in settlements for Mexican ore. Below 5c. the Mexican operator has to cease operations. However, many of the smelters continued to settle for Mexican ores on the basis of spelter being 5c. at St. Louis, although it has been below 4½c. This has brought into the country about 1000 tons of zinc-ore per week. These imported ores make as good spelter as Joplin ores for certain purposes, although for sheet-zinc they would not be such strong competitors. The ores run from 27 to 40%, and, being calamine and carbonates, they require no roasting previous to distillation in the furnaces. This renders them profitable for smelting, and the menace to Joplin ores has grown into goodly proportions. The total ore-production for 1907 in the Joplin district was only 305,000 tons, running perhaps on an average 56% zinc. The Mexican importations averaged only 35%, but even then the importations were more than sufficient to account for the surplus stocks of spelter which the spelter-dealers had on hand at the first of the year.

With this menace staring them in the face the operators have been strenuously fighting to get the treasury department to levy a 20% ad valorem duty on zinc-ores under the paragraph of the Dingley law which provides such duty upon "metallic mineral substances." In this way the operators would secure a benefit of about $4 per ton on all the blendes and carbonates. Calamine, however, is specifically placed upon the free list. The Treasury Department granted their request, and litigation has been in progress for over two years. Before the New York Board of Appraisers the importers were successful in defeating the movement, and the case was carried into the District Court, where there was handed down an opinion which also sustained the importers. The case has been appealed to the Supreme Court, and is still pending. The importers contend that carbonates are calamine and hence duty-free, and that blendes should not be classified as "metallic mineral substance." The Joplin producers contend that carbonates of zinc are not calamine, but that calamine is strictly a silicate ore; and that undoubtedly blende is a "metallic mineral substance in a crude state," and therefore subject to a duty, under the present schedules of 20%. This case will be vigorously prosecuted while the efforts of the new Zinc Ore Tariff Club will be devoted to securing legislation which will be so specific in its terms as to completely shut out all zinc ores. The club will advocate a tariff upon zinc-ore equal to the present tariff upon lead-ore based upon the metallic content. Lead pays a duty of 1½c. per pound on the metal-content. Spelter is also dutiable at the rate of 1½c. per pound.

The importance of this movement is shown in its non-partisan character and in the plans made for a wide range of activity. Branches of the club will be established in every zinc-producing camp of Missouri, Kansas, Oklahoma, Arkansas, Wisconsin, and Illinois. Anyone having any interest in the zinc-industry—and in the Joplin district that includes everybody—is eligible to membership. Chas. T. Orr, of Webb City, is president, and C. B. Guinn, of Webb City, is secretary. With the present low prices paid for zinc-ores in this district and the consequent period of distress there is little need to say that the movement is rapidly gaining favor and strength.

A large number of mills have closed down again to await a better price for ore, thus reducing the rapidly accumulating surplus. It is estimated that this amounts to as much as two weeks' production under normal conditions. The past fortnight, however, has noted larger shipments at an increased price, the basis being $36 for 60% ore. This has reduced the surplus about 4000 tons, but the tendency to re-open mills when the price of zinc-ore advances quickly depresses any advance almost as soon as made.

BUTTE, MONTANA.

New Plant at Colonel Sellers Mine.—Butte-Balaklava Co.—Development on East-Side.—East Butte Mining Co.'s Progress.—Position of La France Copper Co.—Pumping Plant Installed by Boston & Montana Company.

The new hoisting machinery has been installed on the Colonel Sellers claim by the Butte & New York Copper Co. and the shaft is being unwatered preparatory to a resumption of sinking. A 250-gal. electric pump has been purchased and will be installed at the 700-ft. station. The shaft is to be sunk to a depth of at least 1500 ft., and a cross-cut will probably be driven from the 700-ft. station for the purpose of exploring the veins at that depth, though it is not expected that commercial ore will be found there. The new engine has a capacity to work to a depth of 2000 ft. The work is in charge of John Miles, an experienced

mine manager, who has been with the company since its organization several years ago. The Butte & New York Co. is understood to be a holding company for the Butte-Milwaukee Co., which latter was organized to take over the Colonel Sellers and Pollock group of claims, lying north of the Butte & Superior properties. There are four or five large claims in the group, and there are several very strong veins in the Colonel Sellers claim, the surface indications being exceptionally good.

James Macfarlane, who was elected to the board of directors of the Ohio Copper Co., representing the interest that bought out F. Augustus Heinze, was formerly chief engineer of the Anaconda Copper Mining Co., under the late Marcus Daly, and was later with the Haggin interests in Peru. He is a man of exceptional ability, and it is surmised that he will be put in charge of the Ohio company. The Butte-Balaklava Copper Co., which is engaged in developing six acres of mineral ground in the Butte district, and has stated the reason for pooling the Company's stock to be that a rival company might get control and close the property, is now forcing itself into litigation with the Amalgamated Copper Co. About fifteen years ago the Butte, Anaconda & Pacific Railway Co., an Amalgamated ore-transportation concern, secured a right-of-way across the Balaklava mining claim, and has used it ever since, but the Butte-Balaklava Co. has discovered a flaw in the title to the right-of-way, and has instituted suit in the District Court against the railway company to recover possession of the ground. It is reported again that negotiations may result in providing a fund for the Butte & London Development Co., so that it may resume work on its property on the East Side soon. The deal cannot have been a very sure one, for while it was supposed to be pending, directors of the Company endeavored to interest other persons in the Company. The Butte & London Co. has a large tract of well situated mineral ground east of the North Butte and North Butte Extension Co. property, and it sunk a shaft 1100 ft. deep during the flush times. When the slump came, after much unsuccessful exploration had been done at a depth of 1100 ft., work was stopped. The Company has a splendid surface plant, and money in the treasury, but not enough of the latter to carry development work very much farther. The money spent in exploration work on the 1100-ft. level should have been used in sinking to the 1600-ft., at which depth it is believed commercial ore will be found.

The failure of the Boston & Montana Co. to find ore in the Greenleaf at a depth of 1000 ft., but finding the country badly faulted and broken up, may be taken as some endorsement of the action of the Butte Copper Exploration Co.'s directors in stopping work on the Six O'Clock group several years ago, surrendering the options and 'dumping' the stockholders without consulting or notifying them as to the contemplated action. The Six O'Clock claims are near the Greenleaf. The Butte Exploration Co. explored the ground at a depth of 1000 ft. and then concluded that the ground was not worth further exploitation. The veins were found similar to those in the Greenleaf, broken up and containing only small bunches of ore.

Robert H. Gross, president and general manager of the East Butte Copper Mining Co., has completed his examination of the property and affairs of the Company and has made a report to the directors and officers in Boston. Mr. Gross has reduced the fixed charges to the amount of $1000 per month, and has so arranged affairs that the royalties from the precipitating plant and from lessees, who will continue to work on the small veins in the upper levels, will fully pay all fixed charges hereafter. The new funds in the East Butte treasury will be devoted exclusively to sinking and development work. The East Butte Co. occupies an unusual and rather unique position among more than a score of new companies organized to operate in the Butte district during the past two years, in that it is the only company developing new ground that made good, and one of few companies in which the original subscribers and stockholders did not lose money. Frank M. Sullivan, who organized and floated the Company, and was its first president, retires from active management with the friendship of every person who was interested as an original subscriber, a rather remarkable thing when compared with a score of other mining ventures in which Butte people lost millions. Mr. Sullivan not only 'made good' in the first place, but after the financial panic, when it became inadvisable to try to raise funds by the sale of treasury stock, and when other concerns became bankrupt, he succeeded in re-financing the Company, and the East Butte passed to some of the strongest copper interests in America.

The La France Copper Co., which is operating the Lexington mine at Butte, and experimenting with a new zinc process, operated at a loss during the year ending June 1, according to its statement to the authorities. The preceding year it reported net earnings of $491,000, upon which it was taxed $4266. This has not been paid, and the property of the Company has been sold for delinquent taxes. The county became the purchaser, in the absence of other bidders. When the Company redeems the property it will have to pay a 10% penalty and 12% interest on the unpaid tax. The fact that the Company is willing to be assessed so high an interest would indicate its financial difficulties. It also found itself unable to pay interest on its coupon bonds, due in January and July last. The United Copper Co. has offered its one-year notes, due July 1, 1909, for matured coupons and interest at 6%. Most of the bondholders have accepted the proposition. The Company owns a reduction plant at Basin, Mont., and is trying to sell it. Much hope is placed on the new orebody opened above the 800-ft. level of the Lexington, which is developing encouragingly. Samples of the ore have assayed as high as 8% copper and 6.2 oz. silver. The ore is quite free from zinc, and contains a great deal of good chalcopyrite. It is the same vein which was developed and mined above the 500-ft. level, but which the engineers could not find below. During the year ending May 1 the Company spent $301,501 on the zinc-mill. Operations were stopped when the citizens of Walkerville brought an injunction suit on account of the great dust created by the mill. The Company appeared willing to close the plant, for it did not answer the suit and allowed it to go by default.

John A. Ryan, superintendent of the North Butte Extension Co., has returned from New York, where he had been assisting in the re-adjustment of the financial difficulties of the Company. He was called to Butte before matters were settled in New York, but he says there is no doubt that everything will be adjusted satisfactorily in a short time, and work on the property will be resumed. The New York men who have put their money into the Company have full confidence in it, and believe that the Extension has all the possibilities of a big copper producer. They will therefore provide funds for paying off the Company's debts, and resume development work.

The Boston & Montana Co. is installing two new Nordberg quintuplex pumps on the 1200-ft. level of the Leonard mine. They will have a capacity to raise 600 gal. of water per minute from the 1200-ft. level to the surface. The Company will install two more in the near future. The necessity for additional pumping facilities is caused by the extension of the drifts and cross-cuts, thus increasing the water-flow, and by the suspension of work by the Reins Copper Co., on the east of the Leonard, causing a greater flow from that direction. The Reins shaft is filled with water from the 500 to the 1200-ft. level. The Boston & Montana has resumed sinking on the Badger State, and there seems to be little doubt that that property will be developed into a producing mine, as it joins on the end of the Jessie mine of the North Butte Co., the Jessie vein being traced through the Badger State. The shaft was sunk last year to a depth of 560 ft., but all work was stopped at the time of the general suspension. It has not been decided how deep the shaft is to be sunk, but stations will be cut every 200 ft., and when sinking ceases cross-cutting will be done from the station. At present the Boston & Montana is confining its mining to the East and West Colusa and Leonard mines. The gas conditions in those mines have greatly improved, and the trouble reduced to the minimum. Some of the old stopes are still bulkheaded.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Glycerine is an ideal lubricant for the stuffing-boxes of gasoline pumps, as gasoline will neither mix with nor dissolve it.

Ozocerite is a natural paraffin, and is used for making shoe and leather polish, sealing wax, candles, and in the insulation of wires.

Oil spots on marble slabs can be removed by applying a paste made of 1 oz. potash and ½ lb. whiting. The paste should be left on the marble about five hours.

Amalgamation plates may be dressed with a 1.6% solution of hydrochloric acid if it is desirable not to use cyanide. If the commercial hydrochloric acid is used, the proportion should be 1 to 20.

Soldering flux which will cause no oxidation may be made by reducing lead and tin to an impalpable powder and then mixing these with chloride of zinc. This compound is made into a paste by the addition of vaseline or glycerine.

Washed metal is cast-iron from which most of the silicon and phosphorus have been removed by the Bell-Krupp process, without removing much of the carbon, so that it still contains enough carbon to be classed as cast-iron.

Navigable streams are those which have been so declared by the Federal Government. The physical characteristics of the stream have no essential bearing upon its present navigability, except in so far as they influence the official decision.

Theodolite is the English name for an engineer's transit. The instruments are fundamentally the same except that the telescope of the former is made longer, securing thereby better definition, but hence cannot be reversed on its horizontal axis.

Cupellation losses are due to absorption and volatilization. The loss of gold and silver depends upon the temperature of cupellation, the amount of lead with which the gold and silver is cupelled, the physical condition of the cupel, and the nature and amount of the impurities present.

The 'four plumb-bob' method of transferring a meridian into a mine is advantageous in some cases, since it requires no trigonometric calculations. In particularly favorable circumstances the shaft may be plumbed without interrupting hoisting operations, since the plumb-bobs are hung close to the walls of the shaft. It is particularly adapted for use in a multi-compartment shaft. Four plumb-bob strings are so hung in the shaft that the lines joining each pair intersect beyond the lines of the shaft. The azimuth of each line is accurately determined above ground, and the distance between the strings is measured, for use as a check underground. In the underground work it is necessary to 'range in' an engineers' transit until it is exactly at the intersection of the two lines, and hence any desired azimuth may be determined directly by instrumental settings.

Steam-fitters' cement, made of red or white lead mixed with linseed oil, to which rubber or gutta-percha has been added, is much better than common paint. The rubber or gutta-percha should be dissolved in sufficient carbon disulphide to give it the consistence of molasses, then mixed with the oil and left exposed to the air for about 24 hr. before the red lead is added. If oxide of iron be substituted for the red lead the cement will be less brittle.

Black prints, having a white background and black lines, may be made from ordinary tracings by a number of processes. The best method is to make a print in the usual way, with a special black and white paper, and then to use this negative to make either black and white, or blue and white, prints. One of the best of these specially prepared papers is called Vandyke, and is manipulated the same as blue-print paper, except that it requires a bath in a fixing solution after the usual water-bath.

Sand-lime brick is manufactured from sand and lime, the latter being thoroughly hydrated or slaked before using. After the sand and lime-hydrate have been mixed the mixture is molded in presses. The brick is then loaded upon steel cars and run into a horizontal steel cylinder, and subjected to a steam pressure of 125 lb. per square inch for about 6 to 10 hours. The lime and silica combine while under pressure in the steam bath, and form calcium silicate, which is practically insoluble at ordinary temperatures, and which binds the sand grains firmly and durably.

Neutralization of potassium cyanide in waste waters from cyanide plants may be accomplished by the use of sulphuric acid. The waste waters seldom contain more than 0.02% KCy, hence the quantity of sulphuric acid theoretically required would be only about $^{3}/_{10}$ lb. per ton of solution. The difficulty is to effect uniformity of mixture of so minute a quantity of acid with so large a volume of solution in a brief period of time. Wicking extending from a vessel containing the acid and dipping into the launder through which the solution is being discharged, gives a fair degree of success. The best protection against damage to stock is perhaps to be found in plenty of barbed-wire, rather than in neutralization of the cyanide. Horses, dogs, and most domestic animals avoid waters containing cyanide, but the cow seems wanting in discrimination. The dose that proves fatal depends less upon the degree of concentration than upon the absolute quantity taken. It is doubtful whether a cow could drink enough of 0.01% KCy solution to get a fatal toxic effect. Very weak solutions concentrate by evaporation in ponds, so that storage reservoirs may thus become dangerous.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Diffusion as a Factor in Ore Deposition.

The Editor:

Sir—H. H. Knox, in your issue of August 1, affirms that there is no parallel between the case cited by me of the cooling of a slag in a slag-pot and that of the cooling of a fused rock-mass, so far as the operation of Soret's principle is concerned, because of the difference in the time element presented by the two cases. There is no need, I think, to bring the time element into this discussion, because in the first place, as Mr. Knox implies he is aware, the case of the fused rock-mass was discussed as a maximum, and therefore beyond the influence of time, and the numbers in the case of the slag show that these are sufficiently within the range of the maximum to render their discussion as being still under the important influence of the time element of no practical value. But Mr. Knox has further made an interesting suggestion of a possible cumulative concentration of a dissolved metal into an orebody by its diffusion through a small residuum of fused magma after a large portion of the original fused whole has become successively crystallized into minerals that have solidified without entraining within the body of their crystals any of the dissolved metal, the whole of which is therefore concentrated in the still fused residuum. Unless the crystals, as they form, separate by gravity from this residuum there will be no more effective segregation of the metal into the colder portions of the rock-mass than when the whole was fused. The residuum, with the metal content, would be uniformly spread throughout the rock-mass now only semi-fused, and, as regards the fused portion, subject to the same temperature-difference as before. There would have been no concentration regarding the mass as a whole by reason of this partial crystallization of the rock-mass. If the temperature-difference of the hottest part (say the centre), and the coldest part (say the periphery), was as we may conceive it to have been, namely, the difference between say 1500° and 3000° absolute, and if this ratio were not disturbed, then there would be still half as much of the metal as a percentage in the extreme centre as there would be in the extreme periphery and every gradation between, and just the same relative proportions as in the case of the original rock-mass, when, instead of being partly crystallized it had been wholly fused. The mere crystallization of certain minerals has not affected the metal-content of any part, other than as between a crystal and the surrounding fused magma, and there is thereby no further practical concentration.

If, however, we imagine the extreme case of the complete separation by gravitation of the first-forming crystals from the residuum of fused magma (and I do not think we have much justification in nature for assuming this extreme case), the dissolved metal-content will then be concentrated into this fused residuum, still only varying in degree of concentration within itself between the same temperature limits as before. In the coldest portion of the residuum there will be a certain percentage of the metal, and this will diminish imperceptibly toward the hottest portion, where it could hardly be less than one-half of the percentage to be found in the coldest portion. There has so far been no more segregation by Soret's principle than in the original rock-mass as a result of partial crystallization. The Soret principle has been used to explain a class of orebody where there is a sharp break, so to speak, in values between the orebody and the adjacent country from which it is supposed to have magmatically segregated. To have been segregated by Soret's principle there would be no practical definition between the periphery or first-cooling, or the centre or last-cooling portion of the rock-mass. If the periphery contained any commercial percentage, the centre would be so near in grade to the periphery as to be a commercial, or potentially commercial, orebody also. Moreover, there is no evidence that fused rock-magma could dissolve so large a quantity as several units per hundred of a metal as would be implied by a commercial orebody, and it must be remembered that the Soret principle can only be used to discuss the movement of dissolved substances. The influence, therefore, of movement by Soret's principle of the metal within the residuum of the rock-mass left fused, is no different from that obtaining where the whole rock-mass was in the fused state. There will be no sharp separation of the residuum into a smaller portion containing a large percentage of the metal, and a portion immediately adjacent containing it in inappreciable amounts; on the contrary, there must be a gradual transition from a certain percentage to something not very much less. The ratio of the highest to the lowest metal-content of any such residuum as we have discussed would be the same as in the original wholly fused mass. Would this ratio be sufficiently large to make a distinction between an orebody on the one hand and country rock on the other out of the same original fused rock-mass? I think not.

It seems to me fatal to apply this principle to cases where the ratio of the metal-content of the portion called the orebody differs so much from the adjacent rock, assumed to be the original source of such metal, as to make this distinction between an orebody and country rock possible. If we found an orebody containing, say 5% of a metal on the periphery of a rock-mass, we would find in the centre something like 3% and every grade between these limits regularly disposed between periphery and centre. If the periphery were an orebody, so would be the centre. The Sudbury ore deposits display no gradual increase of metallic content from periphery to centre, and yet they are used as an illustration of the action of Soret's principle. I think this is because the limits of the principle have not been fully recognized by those who have sought to make use of it. Furthermore, referring to facts of observation, it is noteworthy that the Sudbury ore-deposits are not even approximately continuous around the

periphery of the intruded norite, but are distinctly localized into masses of limited extent laterally and vertically.

LEWIS T. WRIGHT.

San Francisco, August 5.

Geology of the Lucky Boy Mine, Nevada.

The Editor:

Sir—In extension of the editorial remarks in your issue of July 11, I beg to submit further details concerning the Lucky Boy and Mountain King properties, recently purchased by the Chicago Exploration Co. These are in Esmeralda county, Nevada, seven miles southwest of the old town of Hawthorne. The claims, seven in number, are situated on the eastern crest of the mountain range which rises abruptly from the level valley west of the town. The range is quite steep, and is cut by many narrow and precipitous gulches. The old stage road from Hawthorne to Bodie crosses the property several times as it winds and curves around the hills in its ascent to the summit. The mine is 2200 ft. above the floor of the valley. The rock formation at the mine is hornblende-granite intrusive into limestone. The limestone has been very much deformed and distorted by the intrusion; very acute folds and bends being frequently observed. This deformation has been so severe that the original stratification of the limestone is practically destroyed, and almost any variation of strike and dip can be found. The most persistent strike, and one which may be taken as an average, is N.60°E., and the dip varies from 60° from the horizontal to almost vertical, pitching toward the south. The granite occurs massive and also in dikes through the lime; these dikes vary from an inch or two up to 50 ft. wide, and are roughly parallel to the bedding-planes of the lime. Irregular masses of granite are distributed throughout the limestone, and both dikes and masses are connected by an intricate network of small granite stringers which cut through the lime in a multiplicity of directions. The limestone has been altered to a fine-grained gray marble, and in a few places coarse crystalline calcite is seen. Along the contacts white mica, mica-schist, and bunches of lime-feldspar are sometimes seen, but in most cases the line of demarcation between the limestone and the granite is perfectly sharp, well-defined, and the absence of contact-minerals is particularly noticeable. Both rocks have undergone considerable fracturing and fissuring.

In the smaller dikes the granite is uniformly fine-grained, but in the larger ones, and in the massive granite, the texture varies from very fine at the contacts to quite coarse in the body of the granite. A fresh specimen of the granite showed it to consist of quartz, orthoclase, and considerable hornblende. A few large and scattered biotite crystals also occur. Running through the granite are several basic dikes containing a small amount of quartz, relatively more feldspar, and from 50 to 75% hornblende. The texture of these dikes varies from a very fine homogeneous gray rock to a very coarse-grained one in which the individual hornblende crystals are often a couple of inches long. The principal geologic feature is a well-marked fault which is subsequent to the intrusion of the granite, and cuts impartially across both formations. This fault strikes N.72°E., and dips 70° to the south. The orebodies are found on this fault, and in the mining operations it is shown as a persistent seam of gouge. The ore is principally argentiferous galena, and an intricate mixture of silver sulphides or 'black metal'. The gangue-minerals are quartz and impure calcite, the quartz predominating. Silver chloride and bromide also occur, lining small fractures and fissures, and their bright blue and green colors are very conspicuous.

The orebodies follow the fault-fissure and vary from a few inches to 3 and 4 ft. in width. The ore is not continuous along the fault, but pinches and disappears completely at times, leaving only the seam of gouge as a guide to further mining. 'Feeders' or small stringers of ore in cross-fractures come in, generally from the foot-wall, but occasionally from the hanging-wall side, and apparently have had an important influence on the deposition of the ores. It is at the junction of these feeders with the main fault that the larger orebodies occur. These feeders, and not the nature of the wall-rocks, have apparently determined the arrangement of the ore-shoots, for although in most of the mine-workings both walls are granite, the ore occurs impartially in either formation and is seemingly independent of the walls. The mine is opened by two adits, through which most of the work is carried on, and also by several shafts and winzes. About 1500 ft. of work has been done, and from the showing so far made the mine gives promise of a productive future. Regular shipments of a good grade of ore are now being made. The ore is sacked at the mine and hauled by teams to Thorne, whence it goes to the smelters by rail.

JAMES S. WROTH.

Goldfield, Nevada, August 5.

Methods of Copper Assay.

The Editor:

Sir—In your issue of July 18, M. L. Requa in an article on the 'Experimental Mill of the Nevada Consolidated Copper Co.', makes mention that analyses of low-grade copper ore made on the ground by the iodide and cyanide methods gave results about 0.12% higher by the iodide method; while certain samples of concentrate assayed electrolytically by the Tennessee Copper Co. gave results from 0.61% to 2% higher than the cyanide results obtained at the mill. From an experience covering numerous comparisons of the three methods, I beg to express a few opinions concerning the accuracy of these methods and to give some results obtained by me in ordinary routine work, taken at random from the records of the King Metallurgical Laboratories.

In the cyanide and iodide assays the usual method is to precipitate the copper on aluminum foil from a sulphuric acid solution. As ordinarily performed the separation is not complete, due to the incomplete expulsion of the nitric acid by the sulphuric acid, or to the presence of large amounts of iron salts. The final traces of copper may be brought down by the

addition of hydrogen-sulphide water, followed by washing with the latter. Washing with water or undue exposure of the copper, whether in the finely divided metallic form or as the sulphide, causes an oxidation of the latter, followed by its solution and loss. Consequently the precipitate should be kept under hydrogen-sulphide water as much as possible during the washing. Provided the ore is of such a nature that the copper may be accurately precipitated electrolytically from a simple solution, the results by the iodide or cyanide assay, where the treatment with hydrogen sulphide is omitted, will usually be lower. Furthermore, there is always a loss in filtering a copper solution. Often several hundredths of one per cent of copper will, regardless of the number of washings, be retained by the filter-paper.

On the other hand the potassium iodide used in the iodide assay is very easily reduced. Even traces of certain impurities in the precipitated copper or in the reagents used will liberate an appreciable amount of iodine, and cause high results. This will easily account for the difference of 0.12% between the iodide and cyanide assays mentioned by Mr. Requa. In a carefully conducted iodide-assay, in which hydrogen-sulphide water has been used, the gain in copper due to impurities need not exceed the loss in handling. Close checking of duplicates is a guarantee of the accuracy of the work, provided the standardization has been correct, but any carelessness in handling causes a gain or loss in the amount of iodine liberated. The same is not true of the cyanide assay, where the titration is rougher, and much is left to the judgment of the analyst. Of the two methods, the cyanide, while satisfactory for ordinary work, is less preferable to the iodide. Furthermore the cyanide method depends for accuracy upon the same working-conditions as to bulk, foreign salts, and free ammonia as prevailed in the standardization, things not always easy to regulate, and variations from which do not exert the same influence in the iodide assay.

Mention was made regarding ores on which an electrolytic-assay might be made accurately from a simple solution. Unfortunately such a method is not always permissible. Many elements and, except under nicely regulated conditions, even zinc and large amounts of iron, will cause errors. Except in the case of great excess of iron-salts, the errors are nearly all positive, and give high results. In all such cases the copper must be separated from the interfering elements. Usually the procedure is simple enough, but occasionally a high degree of skill is required. For these reasons the iodide method, with its almost unfailing accuracy, is usually preferable to the electrolytic. In this laboratory, where various ores of unknown composition are handled, it is customary to separate the copper out by an electrolytic assay, and in addition check the work by the iodide method.

To sum up, where no previous separation of the copper from interfering elements is necessary, the electrolytic is the preferable one of the three methods; otherwise the iodide is better. Under certain conditions the iodide method has been known to fail. In such cases it is left to the originality of the chemist to devise a method to fit the emergency. In the analysis of very rich gold ores, as in the case of the Mohawk ore running about 2% copper and 2% gold, results were from 0.25 to 0.50% high in copper by the iodide method. A simple filtration of the suspended matter previous to the addition of the acetic acid, preparatory to the titration, remedied the defect in the method. Such ores, however, are rare, and the liability of encountering interfering elements is much less in the iodide than in the electrolytic method.

The following are some results obtained in testing ore, tailing, and matte, by the three methods:

	Method of Analysis.		
	Cyanide.	Iodide.	Electrolytic.
Material.	%	%	%
Ore	3.13	3.12	...
Ore	0.86	...	0.91
Ore	1.15	...	1.28
Ore	1.75	1.77	1.76
	1.69	1.77	
Ore	2.99	3.02	2.90
	2.99	3.00	
Ore	2.21	2.30	2.20
	2.16	2.23	2.25
Ore	1.78	...	1.85
Ore	2.43	...	2.47
Ore	...	1.85	1.90
		1.90	1.85
Ore	...	1.85	1.84
		1.95	1.90
Ore	...	9.09	9.08
		9.05	9.08
Ore	...	2.31	2.30
Ore	...	2.32	2.35
Ore	...	2.18	2.17
Ore	...	4.58	4.54
Ore	...	3.21	3.22
		3.23	
Ore	...	3.66	3.60
		3.71	
Tailing	0.25	0.20	...
	0.20		
	0.22		
	0.20		
Tailing	0.25	0.22	...
	0.25		
	0.25		
	0.22		
Tailing	...	0.36	0.36
		0.37	
Tailing	...	0.27	0.27
		0.27	
Matte	...	26.97	27.04
		26.89	27.04
Matte	...	23.73	23.80
		23.66	
Matte	...	26.69	26.64
		26.52	

From the above it will be seen that there is no marked tendency for the iodide assay to be higher or lower than the electrolytic method. The cyanide results are usually the lowest of the three. More attention was given to the cyanide analyses than is usually the case. To secure a sharp end-point in the titration the bulk of the solution was kept low, in proportion to the copper present, and a standardization was made under exactly the same conditions.

It should be borne in mind, in comparing the iodide and electrolytic methods, that the danger of

interfering elements is much greater in an electrolytic than in an iodide-assay. The copper can almost always be separated by precipitation on aluminum, followed by hydrogen-sulphide water in a state pure enough for an iodide assay. This is less true of the electrolytic method, where often to assure accuracy a more elaborate separation must be made. The liability to error in standardizing an iodide solution, which is very remote, is more than offset by the loss in copper attending the removal of the cathode from the electrolyte, and to the error in weighing the same. In a well-equipped laboratory, on ores where no separation is required, the time factor is much in favor of the electrolytic method.

JAMES W. HOWSON.

San Francisco, July 24.

Explosion in Compressed-Air Main.

The Editor:

Sir—I enclose a photograph illustrating the effects of an explosion of gas generated in the air-compressor of the Tonopah Mining Co. of Nevada. The pipe is 6 in. diam., and the contorted piece highest in the pile was bent completely back on itself in two places. The upper side as shown in the picture was the outside of the pipe. The explosion occurred in the Mizpah shaft on April 14 of this year. It was

Effect of Compressed-Air Explosion.

confined to the pipe between the surface and the 300-ft. level, wrecking all of it. A few minor timbers were torn out; aside from this no serious damage was done. The explosion did not extend back to the receivers or the compressor, nor to the pipe below the 300-ft. level, and fortunately the cage-tender was not within those limits.

The explosion was due to gas generated in the compressor-cylinders from the oil used in them. A few weeks after this explosion there was a similar one at the compressor-plant of the Standard Oil Co. in California, and today the compressed-air line of the Tonopah Belmont Co. exploded in the shaft, and on the surface. The cylinder oil used at both the Mizpah shaft and the Belmont shaft was supplied by the Standard Oil Co., and it is to be presumed that the oil used in their own compressor was the same. This series of explosions in such close succession constitutes a serious reflection on the quality of oil furnished by the Standard Oil Company.

J. A. BURGESS.

Tonopah, Nevada, July 24.

Milling and Cyanide Practice at the San Prospero Mill, Guanajuato.

The Editor:

Sir—In J. S. Butler's description of cyanide practice at the San Prospero plant, appearing in your issue of July 25, the curve sheets and tables showing the progress of extraction during the milling operation prior to the commencement of the cyanide treatment proper, make an interesting record. The table showing the extraction of values is as follows:

	Gold Extraction, %	Silver Extraction, %
In the batteries	31.2	4.8
Between the batteries and concentrators	5.4	5.6
Between concentrators and sand plant	21.0	5.0
Total mill extraction	57.6	15.4

The extraction of the silver and gold content, 48% and 31.2%, in the crude ore during the pulping process in the battery is more remarkable when the conditions are analyzed. In a five-stamp battery of this mill, where the crushing-capacity is 3.7 tons per stamp per 24 hr., 28.5 lb. of ore must be fed to each battery per minute, and a like amount (dry weight) of pulp must issue through the battery screens in the same time. As the amount of ore undergoing the pulping process within a five-stamp mortar will approximate 85 lb., it follows that the average time required for pulping the ore in the mortar would not exceed three minutes. During this time it is known that the size of the ore-pieces found at any time in the mortar will vary from the maximum size, 1½ in., to the portion of slime resulting from the pulping operations, and it is probable that 50% of the 85 lb. of ore always in the mortar box would be large enough to remain on a ¼-in. mesh screen. What is remarkable is that ore of this disproportion of sizes when submitted to contact with 0.12% KCy solution should yield 31.2% of its gold, and 4.8% of its silver content in three minutes. If the solution of silver and gold in the pulp would proceed at the same rate all the gold in the pulp would be brought into solution in four minutes and the silver in about 60 minutes. This is a more rapid rate of solution than is generally understood to be possible in connection with the cyanidation of ore, and the fact should attract the attention of those crushing ore in cyanide solution and stimulate investigation.

It would be interesting in this connection to know the character of the ore treated, and in what form the silver occurs in it. It is probable that a large portion of the silver exists as a chloride, for silver sulphide would hardly go into solution as rapidly as stated. At any rate the statement should open up a new line of investigation and research, the results of which cannot fail to benefit the industry.

BERNARD MACDONALD.

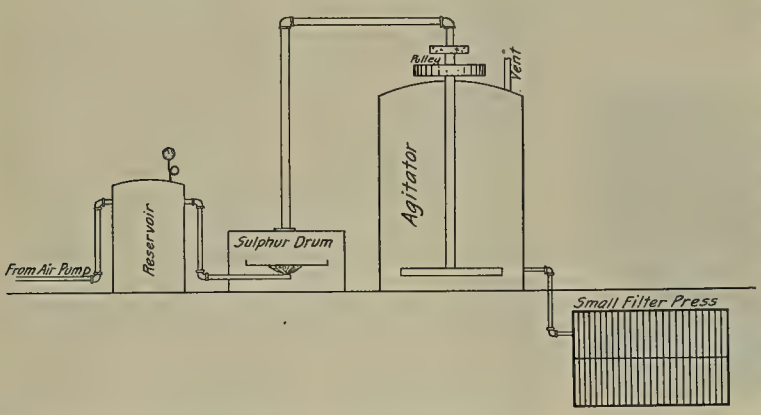
Guanajuato, Mexico, August 1.

The crushing strength of ice at 23°F. varies between 400 and 700 lb. per square inch.

MILLING PRACTICE IN NEVADA GOLDFIELD REDUCTION WORKS.

Written for the MINING AND SCIENTIFIC PRESS
By E. S. LEAVER.

The mill of the Nevada Goldfield Reduction Works at Goldfield is a custom plant, all ore being received through the sampling works. As the ores are sampled and purchased in small lots, this allows mill-results to be followed closely, and as the ores come from various mines and leases, including surface-dumps and deep workings, the results and treatment vary considerably. The surface, or oxidized ores, readily give high extraction by simple treatment. The sulphide ores require close attention, and in depth are becoming even more complex. The deeper ores, now being marketed, require close concentration, almost absolute sliming, and not less than 10 days' cyanide contact. The treatment consists in crushing wet by stamps, amalgamating on plates, concentrating on Wilfley tables, fine-crushing of the sand in a tube-mill, re-amalgamation on plates, re-concentration on vanners, and cyaniding of the sand and slime.



The ore is crushed in weak cyanide solution (0.1%), and while this has been the practice for over a year, no particular effects are noted on the plates. The entire recovery has been better than formerly when crushing with water. The plates require more attention, but all pitting is avoided and the amalgamation has been good. By crushing in cyanide, treatment is favored, in that the ore is at once in contact with the solvent, and there is elimination of the loss of time in settling, decanting, etc. Also this practice avoids the loss in weak solution necessary in cyanide-plants where the ore is crushed in water or taken into the cyanide plant with water. In addition to the usual losses in waste-solution, the cost of water is an important item at Goldfield. Having only limited fall from the Wilfley tables to the tube-mill, advantage is taken of Wilfley tables as sizing machines, making three products, sand, slime, and concentrate. Only the sand is taken to the tube-mills, the aim being to grind it as fine as possible, and to favor passing as much of the finest sand as commercial treatment allows with the slime proper. As the ore in various mines differs, the percentage of slime and sand will vary, but approximately 20% of the original weight is treated as sand. This sand will pass the 100 mesh, and requires 10 to 20 days' double treatment by percolation, that is, the sand is collected and treated in an upper row of vats, discharged, and re-treated in a lower row of vats. Good success has attended the use of a substitute for tube-mill pebbles. The Danish pebbles were originally imported at a cost of about $60 per ton. A number of samples picked from medium low-grade ores were experimented with. The result was the finding of a close-grained compact ore which is an excellent substitute for the imported pebbles. Several tons of lumps can be selected from the ore in a short time. These lumps, varying in size, are fed into the mill, and in a short time it requires close inspection to detect them from the genuine imported pebbles. Results from these pebbles show a saving of $100 per mill per week.

The crushing or circulating solutions, after passing the concentrators, including the sand-collection vats, flow to large slime-collection vats, and the clear solution is taken off by rim-launders and decanters. This circulating solution then passes through its special zinc precipitation boxes, and is returned to the battery-tanks, to be again used under the stamps. When the slime at the collecting vats is at a proper specific gravity it is pumped to the treatment vat, where the strength of the solution is brought up if necessary. There it is agitated and aerated by circulation through centrifugal pumps, until the gold is in solution. This requires from 4 to 10 days. The slime is then separated from the gold-bearing solution by leaf-filters.

After a commercial failure with a well-known leaf-filter a number of experiments were made in the mill which led to the designing of a leaf which has given excellent results. The ordinary form or size of leaf was continued, but a filler was adopted that leaves no chance for clogging. This has been in constant use at these works for about one year, and has given perfect satisfaction. The canvas for the filter is sewed around the bottom and sides, making a bag about 5 ft. deep and 10 ft. long; the sewed edges are turned inside the bag; then, excepting about a three-inch strip along the sides and bottom, which is left for the pipe-frame work and suction, the entire filter is divided by stitching vertically in lines two inches apart, making pockets open at the top and bottom. Into these pockets are pushed grooved slats made of common lath. The grooves are about $^1/_{16}$ in. deep and about ¼ in. wide. Two grooves run lengthwise on each face, and each groove is placed so as to alternate with the groove on the opposite side, so as not to weaken the slats. Various experiments were made to determine the proper size of slat, number of grooves, etc., and the above was finally adopted.

Zinc fibre is used as a precipitant. The resultant product is roughly cleaned up, thrown into a small agitating-vat, and cut down by sulphurous acid. Sulphurous acid is a solvent for lime, zinc, and copper, making it preferable to sulphuric acid. Again, it is cheaper, and it appeals to the men directly handling the products, as they avoid the disagreeable stiute for tube-mill pebbles. The Danish pebbles is shipped in, and is burned, the gas passing directly into the agitating-vat containing the zinky product and water in circulation. After the impurities are in solution, the fine gold and silver residues are drawn into a small filter-press, dried, and melted into bullion, which is sold to the United States mint.

RECENT CONCRETE TESTS.

At the Structural Materials Laboratories of the United States Geological Survey in St. Louis, Mo., important tests on the strength of plain concrete beams have just been completed. These form part of a comprehensive series of investigations undertaken by the Government for the purpose of determining the strength of concrete, plain and re-inforced.

Although it is true that concrete possesses but little strength in tension and must be re-inforced with metal to resist tensile stresses, it is believed that no study of concrete would be complete without a series of tests establishing its strength without re-inforcement. The tests reported indicate that concrete is unsuitable for use under conditions where it must resist tensile stresses, because of the small loads it will sustain and particularly because of the suddenness with which it fails, in striking contrast to the behavior of re-inforced concrete, which usually shows a gradual development of cracks preceding failure. These beam-tests cover 144 beams without re-inforcement 8 by 11 in. in section, and 13 ft. long, together with the corresponding compression-test pieces, consisting of cylinders 8 in. diam. by 16 in. long and of 6-in. cubes. An attempt has been made to bring out the comparative value of gravel, granite, limestone, and cinders for use in concrete; the effect of age and consistency on the strength, as shown by the modulus of rupture of the long and short beams and by the ultimate strength of the cylinders and cubes; and the influence of age and consistency on the stiffness, which is indicated by the unit-elongation of the long and short beams and by the initial modulus of elasticity, as determined by tests of the cylinders. Three consistencies: wet, medium, and damp, were arbitrarily chosen. Tests were made at the ages of 4, 13, 26, and 52 weeks.

The effect of age is perhaps the most important, since an early attainment of considerable strength, and no subsequent decrease in strength, are two essential qualities in concrete. The least age at which any tests were made was four weeks, and at that period in no case except that of the cinder-concrete, wet consistency, did the compressive strength fall below 2000 lb. per square inch, while the cinder-concrete had in every case a compressive strength of at least 1000 lb. per square inch. The compressive strength shows a substantial increase from four to thirteen weeks, with the single exception of limestone-concrete mixed to a wet consistency, for which a decreased strength is indicated by the tests, a decrease which continues to the age of twenty-six weeks. This decrease in the strength of the limestone-concrete is unexplainable. The other aggregates show either the same or a slightly greater strength at twenty-six weeks than at thirteen weeks. The transverse tests on both the long and the short beams bear out the fact indicated by the compression tests on the cylinders and cubes, and lead to the belief that the tensile and compressive strength are affected alike by both age and consistency. In almost every case the concrete of damp consistency is the strongest and that of wet consistency the weakest. This is true for the three ages at which the concrete was tested, and is confirmed by the tests of the beams as well as of the cylinders and the cubes. Attention is called to the fact that the damp consistency used is much wetter than the damp consistency used in making mortar building blocks, for which the same conclusions may not apply.

The difference in strength of the stone and gravel-concretes of the three consistencies is more pronounced than in the case of the cinder-concrete. The effect of the consistency on the strength seems to depend to a great extent on the behavior of the concrete while being tamped and to the method used in tamping. Great care was taken to tamp all the concretes in the same manner. The thorough mixing of the concrete is absolutely essential and has a marked influence on the consistency. The relatively slight influence exerted by the consistency on the strength of cinder-concrete may be partly due to the structural weakness of the cinders themselves, which in the drier mixtures were to a great extent broken up by the tamper, while in the wet mixtures, the cinders would move from beneath the tamper. While it is true that in almost every instance the drier mixtures give the greater strength, it does not follow that dry, or damp, mixtures should be used in construction. Practical considerations warrant the use of a wet mixture. The difficulty in securing efficient tamping and a smooth finish in a damp concrete, the loss of strength due to the unavoidable drying out of the concrete used above water, the difficulty of securing in re-inforced concrete an intimate union with the steel, and the far greater ease of placing wet concrete, all seem to warrant the sacrifice of what in many cases is but a slight difference in strength for a greater case of manipulation and a thorough bedding of the steel, which is of the utmost importance in re-inforced concrete work.

The total Panama canal excavation since the American Government took possession, in May, 1904, up to the end of the fiscal year ended June 30, 1908, amounted to 40,938,575 cu. yd., which includes the earth moved from the canal prison and from accessory works. Of this amount 66% has been taken out in the last fiscal year.

The Austrian railroads, which have heretofore run on the left-hand track of a double-track roadbed, have now changed to right-hand running.

MR. MURPHY ON ORE DEPOSITS.

Written for the MINING AND SCIENTIFIC PRESS
By an Occasional Contributor.

"Ye wudn't think McCarty t' look at ut, that th' piece iv quartz ye-er sittin on could be iv much interest t' annywan, but 'tis so—— Now kape quiet an' don't git excited, f'r 'tis not high-grade. It could just as well be th' ither piece ye've bin throwin dirt at, f'r 'tis syentiffick intherest I'm rayferrin to.

"Thim syentiffick la-ads are a grate lot, an' there's no tellin what they'll do next. 'Twould ma-ake ye laff sometimes t' see what they'll git all wor-rked up an' excited about. Like as not if ye go into th' labbertoory iv wan iv thim, ye'll find him screwin his eye into a little brass toobe on a stand, that he calls a micryscoop, an' if ye ask 'im what he's doin, he'll look at ye with pity, an' sa-ay that 'tis a gra-ate diskivery he's just made.

"'What is ut?' ye say.

"'Why!' he says, 'here's a foine specymen iv th' ———,' an' he says a na-ame that makes ye dooble up ye-er fists till ye foind he's not rayferrin t' you.

"'In plain English, what is ut?' ye ask.

"'A flea,'' he says. 'An' in th' specymen I'm now examinin I foind there ar-re twinty-three hairs on his left hind leg, while all th' rist I have iver seen had but twinty-two.'

"'Well, what of ut?' ye ask him.

"'Why, 'tis a gra-ate diskivery,' he says; 'an' maybe some time I'll have a new flea named afther me.'

"'Well,' ye says, 'if that's all that's bitin' ye, I'll na-ame me dog afther ye, an' he's full iv fleas.' But all th' thanks ye git is a har-rd look.

"Av coorse th' syentiffick la-ads ar-re not all like this wan, but 'tis a str-rong raysemblance there is betwane all iv thim.

"Th' la-ads that dayvote their time chafely t' studyin' th' rocks an' talkin' about it aftherwards have bin pullin' off raycently what they'd call a semynar-ry if they'd bin all thegither; an' they're a foine lot iv la-ads, all iv thim.

"There's Von Hi-ist, who still thinks they ma-ake sarpintine rock in Californy be stirrin' wather an' epsom salts thegither in a sand bank. There's Rickard an' DeKalb, who have steddy jobs now writin' f'r th' pap'rs. There's me frind Horse Winchell, who wor-rks on th' raleroade f'r Jim Hill; an' Emmons, who made th' good guess at Leadville. An' thin there's Weed, who bate Emmons into print at Butte; an' Lindgren, who's got a job kapein books f'r Tiddy. There's Kemp, who writes books f'r pocket money, an' Wright, who borrows his principles fr'm Sorray; an' Spur-r-r, who used t' work f'r Dan'l-in-th'-lion's-den, befoor th' Lord f'rgot 'im. An' thin there's me frind Turner, with his perknite——"

"What kind iv a night's that?" asked McCarty.

"'Tis a dar-rk night," replied Murphy. "I'm surprized at ye-er ignorance.

"Th' la-ads put a bit iv rock in a micryscoop, which is a sort iv nickle-in-th'-slot-masheen, an' all ta-ake turns lookin at ut. Ye put in ye-er nickle an' ye see a picture iv a crazy-quilt like ye-er granmither used t' ma-ake.

"Wan iv th' la-ads screws his eye into th' brass toobe f'r a while, an' thin raymar-rks that there be a small red patch in th' upper left-hand corner, with a nick in wan soide. 'Tis a sign,' he says, 'thot th' wather cooms up in a mine fr'm th' bottom.' Anither la-ad takes a look. 'There's a small black speck jist below th' red patch,' he says, 'that has th' corners rounded off. 'Tis a sign that th' wather cooms down fr'm th' top,' he says."

"I niver was in a mine yit," said McCarty, "where th' wather didn't coom down fr'm th' top befoor it were poomped up fr'm th' bottom."

"Anither la-ad steps up an' looks in." continued Murphy. "'I judge fr'm th' appearance iv th' yellow patch with th' hole in th' middle,' he says, 'that th' wather cooms up fr'm the bottom first, an' thin cooms down fr'm th' top,' he says. Wan more la-ad screws his eye into th' brass toobe an' says, 'Th' striped patch on th' ither soide indicates t' me moind that th' wather cooms in fr'm th' soides,' he says. Th' la-ad Wright looks in. 'Hurray!' he says. 'Saylute me saylushun; ye-er all iv ye wrong. Th' wather doesn't move at all,' he says. An thin th' la-ad Spur-r-r takes a squint. 'Tis as plain as th' nose on ye-er fa-ace,' he says, 'that th' wather always cooms up fr'm th' bottom,' he says. With that he takes anither look. 'I was not mistaken,' he says, 'an' could not be. Th' wather always cooms down fr'm th' top,' he says. After th' next look, which is a good long wan, he says, 'Tis proved beyond question iv a doubt, as I just raymar-rked, that the' wather is har-rd, an' always cooms in fr'm th' soide, straight fr'm th' nearest volcayno,' he says. An' thin he strikes an attitude, an' smiles like th' Raypooblican pictures iv Willyum Chinnings Brine, 'till th' bye Horse, who'se a mischayvous la-ad, hits him in th' eye with a strame fr'm th' fire hose, an' ma-akes him f'rgit all that he's said."

"Where does Jawn Hammond say th' wather cooms fr'm?" asked McCarty.

"Well," said Murphy, "since th' Raypooblicans giv him th' cold ba-ath, he's had domned little t' sa-ay about annything."

Butte uses 200,000 mining stulls annually. About three-fourths of this number are secured from the Deerlodge National Forest west of the city. The Allen Company has purchased from the Government the timber which the Forest officers think can be removed with safety to the forest on an area of about 8000 acres, and it is estimated that they will secure about 50,000,000 feet, board measure, under this one contract. The Company also supplies the smelter at Anaconda with converter poles, and small cordwood to the public. The timber is almost wholly lodgepole—a tree of small size, but large enough for stulls, lagging, and converter-poles.

Sudden enlargement in the section area of a pipe running completely full of water, often causes more loss of head than an equal contraction. Changes in size of pipes should always be obtained by gradual transition.

MOISTURE IN THE ATMOSPHERE AND ITS EFFECT ON THE OPERATION OF COMPRESSED-AIR MACHINERY.

By H. M.-Prevost Murphy.

*Ever since the introduction of compressed air into the railway and commercial fields, much imperfect operation and many failures have resulted from the presence of condensed moisture in vital parts of the apparatus used. Long practical experience and careful scientific investigation have, however, demonstrated that difficulties arising from this source may be reduced to comparative insignificance, if not entirely eliminated, by properly installing the various devices concerned. The objects of this article are to point out the physical laws involved in the subject, to explain the most approved methods of securing 'dry air' for use in any system, and to establish a correct method for determining the amount of moisture that is deposited by compressed air under various operating conditions.

The evil effects of an excess of moisture, if permitted in any system of condensed-air pipes, are very great. In warm climates, where freezing weather is never experienced, any water passing through and deposited in the various valves and passages is not a positive source of danger, although it may cause extremely sluggish and unsatisfactory operation, but it will inevitably produce a much more rapid deterioration of the apparatus than would otherwise be the case. On the other hand, in latitudes where freezing does occur, for even short periods of time, any water which is deposited in these systems is not only liable to burst pipes and valves, but also to so obstruct the ports and passages of the various devices, and even to so entirely block the action of the moving parts, that failures from this source are, unfortunately, of frequent occurrence during the winter months.

In order to clearly understand the situation and to obtain a useful knowledge of the methods employed in practice to obviate the difficulties experienced from the presence of the moisture in the atmosphere, it will be necessary to first investigate the simple unvarying physical laws which govern the case. These laws may be stated as follows:

1. Atmospheric air always contains some moisture, which it absorbs from rivers, creeks, rainfall, and the like.

2. The amount of moisture present in the atmosphere depends on local conditions and on the weather.

3. The maximum amount of moisture that pure air can contain depends only on its temperature and pressure, and has an unvarying value for each condition.

4. The higher the temperature of the air, the greater is the amount of moisture that it can contain.

5. The higher the pressure of the air, the smaller is the amount of moisture that it can contain.

6. When air is compressed, its temperature rapidly rises to a high point, which depends on the design and speed of the compressor and the delivery-pressure worked against.

7. The rise of temperature due to the compression of the air far more than offsets the opposite effect of the rise of pressure on the moisture-carrying capacity of the air.

As a result of these laws, it is easy to see how water is deposited by compressed air as it passes from the pump to the various portions of the system. Suppose that a certain amount of atmospheric air enters a compressor, and that this air is at the saturation point, that is, that it contains all the moisture possible at the existing outside temperature and pressure. Then as this air is compressed as stated in law 7, its moisture-carrying capacity rapidly increases, for the rise of temperature more than offsets the opposite effect of the rise of pressure, consequently all the moisture in the air is still retained by it, and passes with it into the main, or storage-reservoir, and its connecting pipes. Now if this air is permitted to pass from here into the various parts of the system before being cooled to the outside-temperature, it will, of course, carry more moisture with it than it is capable of holding in suspension when the temperature finally drops to the normal point, and this excess quantity will then be deposited, because, the pressure being high, the air cannot hold as much moisture as it did at the same temperature and at atmospheric pressure (law 5).

Now, as will be readily seen, in order to reduce to a minimum the evil effects of this water, which is bound to appear in any compressed-air system under average weather conditions, it is most desirable to cause the air to deposit all of its excess moisture in the main reservoirs, from which it may be easily removed by the drain-cocks which should always be provided for that purpose. In order to accomplish this completely, it is merely necessary to cool the air to the outside temperature before it leaves these reservoirs. This may easily be done by using a sufficiently long air-discharge or radiating-pipe between the pump and the main reservoirs, which should be of large capacity, not only to provide for an ample storage of air, but also in order to allow the compressed air to remain in them for a length of time sufficient to permit the superfluous moisture to be completely deposited, and to insure a liberal supply of cold air at all times. The use of pressure-reducing valves between the main reservoirs and the rest of the system is sometimes considered of benefit in securing 'dry air,' but as such devices simply cause some of the moisture to be deposited in the pipes near at hand (not in the main reservoirs), instead of in the more remote parts of the system, the merits of this method are extremely doubtful, and it should never be resorted to unless drain-cups are placed in the pipes concerned, for excess water-vapor, once allowed to pass from the main reservoirs, will surely cause ultimate trouble unless it be properly trapped and regularly drained off.

In stationary work, where the air is sometimes reheated before being used, in order to increase the efficiency of the devices operated by it, no trouble ought ever to be experienced from the moisture, but

* Abstracted from *Engineering News*, June 18, 1908, by permission of publishers. Copyright, 1908, by Engineering News Publishing Company.

TABLE I.—A TABLE WITH FORMULAS GIVING THE WEIGHTS, IN POUNDS, OF 1 CU. FT. OF DRY AIR, OF 1 CU. FT. OF SATURATED STEAM OR WATER VAPOR AND THE MAXIMUM WEIGHT OF WATER VAPOR THAT 1 LB. OF PURE AIR CAN CARRY AT ANY PRESSURE AND TEMPERATURE. (Copyright, 1908, by H. M.-Prevost Murphy.)

TABLE I.

Giving the Values of 'K' and 'H' Corresponding to Each Fahrenheit Degree of Temperature From 30° Below to 434° Above Zero.

Temperature Degrees Fahrenheit.	Values of K	Values of H	Temperature Degrees Fahrenheit.	Values of K	Values of H	Temperature Degrees Fahrenheit.	Values of K	Values of H	Temperature Degrees Fahrenheit.	Values of K	Values of H	Temperature Degrees Fahrenheit.	Values of K	Values of H
-30	.6082	.0099	17	.6132	.0941	64	.6188	.5962	111	.6251	2.654	158	.6323	9.177
-29	.6083	.0105	18	.6133	.0983	65	.6189	.6175	112	.6253	2.731	159	.6325	9.460
-28	.6084	.0111	19	.6134	.1028	66	.6190	.6393	113	.6255	2.811	160	.6326	9.628
-27	.6085	.0117	20	.6135	.1074	67	.6192	.6617	114	.6256	2.892	161	.6328	9.860
-26	.6086	.0123	21	.6136	.1122	68	.6193	.6848	115	.6257	2.976	162	.6330	10.10
-25	.6087	.0130	22	.6137	.1172	69	.6194	.7086	116	.6258	3.061	163	.6331	10.34
-24	.6088	.0137	23	.6139	.1224	70	.6196	.7332	117	.6260	3.149	164	.6333	10.59
-23	.6089	.0144	24	.6140	.1279	71	.6197	.7585	118	.6261	3.239	165	.6335	10.84
-22	.6090	.0152	25	.6141	.1336	72	.6198	.7846	119	.6263	3.331	166	.6336	11.10
-21	.6091	.0160	26	.6142	.1395	73	.6199	.8114	120	.6264	3.425	167	.6338	11.36
-20	.6092	.0168	27	.6143	.1458	74	.6201	.8391	121	.6266	3.522	168	.6340	11.63
-19	.6093	.0177	28	.6144	.1523	75	.6202	.8676	122	.6267	3.621	169	.6341	11.90
-18	.6094	.0186	29	.6146	.1590	76	.6203	.8969	123	.6269	3.722	170	.6343	12.18
-17	.6095	.0196	30	.6147	.1661	77	.6205	.9271	124	.6270	3.826	171	.6344	12.46
-16	.6096	.0206	31	.6148	.1734	78	.6206	.9585	125	.6272	3.933	172	.6346	12.75
-15	.6097	.0216	32	.6149	.1811	79	.6207	.9906	126	.6273	4.042	173	.6349	13.04
-14	.6098	.0227	33	.6150	.1892	80	.6209	1.024	127	.6275	4.153	174	.6350	13.34
-13	.6099	.0238	34	.6151	.1960	81	.6210	1.057	128	.6276	4.267	175	.6352	13.65
-12	.6100	.0250	35	.6153	.2039	82	.6211	1.092	129	.6278	4.384	176	.6353	13.96
-11	.6101	.0262	36	.6154	.2120	83	.6213	1.128	130	.6279	4.503	177	.6355	14.28
-10	.6102	.0275	37	.6155	.2205	84	.6214	1.165	131	.6281	4.625	178	.6357	14.60
-9	.6103	.0289	38	.6156	.2292	85	.6215	1.203	132	.6282	4.750	179	.6359	14.92
-8	.6104	.0303	39	.6157	.2382	86	.6217	1.242	133	.6284	4.877	180	.6360	15.27
-7	.6105	.0317	40	.6158	.2476	87	.6218	1.282	134	.6285	5.008	181	.6362	15.62
-6	.6107	.0332	41	.6160	.2572	88	.6219	1.324	135	.6287	5.142	182	.6364	15.97
-5	.6108	.0348	42	.6161	.2673	89	.6221	1.366	136	.6288	5.280	183	.6365	16.32
-4	.6109	.0365	43	.6162	.2776	90	.6222	1.410	137	.6290	5.420	184	.6367	16.68
-3	.6110	.0382	44	.6163	.2883	91	.6223	1.455	138	.6291	5.563	185	.6369	17.05
-2	.6111	.0400	45	.6164	.2994	92	.6225	1.501	139	.6293	5.709	186	.6371	17.43
-1	.6112	.0419	46	.6166	.3109	93	.6226	1.548	140	.6294	5.859	187	.6373	17.81
0	.6113	.0439	47	.6167	.3227	94	.6227	1.597	141	.6296	6.011	188	.6374	18.20
+ 1	.6114	.0459	48	.6168	.3350	95	.6229	1.647	142	.6298	6.167	189	.6376	18.59
2	.6115	.0481	49	.6169	.3477	96	.6230	1.698	143	.6299	6.327	190	.6377	19.00
3	.6116	.0503	50	.6170	.3608	97	.6232	1.751	144	.6301	6.490	191	.6380	19.41
4	.6117	.0526	51	.6172	.3743	98	.6233	1.805	145	.6302	6.656	192	.6381	19.83
5	.6118	.0551	52	.6173	.3883	99	.6234	1.861	146	.6304	6.827	193	.6383	20.25
6	.6120	.0576	53	.6174	.4027	100	.6236	1.918	147	.6305	7.001	194	.6385	20.69
7	.6121	.0603	54	.6175	.4176	101	.6237	1.976	148	.6307	7.178	195	.6387	21.13
8	.6122	.0630	55	.6177	.4331	102	.6238	2.036	149	.6309	7.359	196	.6389	21.58
9	.6123	.0659	56	.6178	.4490	103	.6240	2.098	150	.6310	7.545	197	.6391	22.04
10	.6124	.0690	57	.6179	.4655	104	.6241	2.161	151	.6312	7.736	198	.6393	22.50
11	.6125	.0722	58	.6180	.4824	105	.6243	2.226	152	.6313	7.929	199	.6394	22.97
12	.6126	.0754	59	.6182	.4999	106	.6244	2.294	153	.6315	8.127	200	.6396	23.46
13	.6127	.0789	60	.6183	.5180	107	.6246	2.362	154	.6317	8.328	201	.6397	23.94
14	.6128	.0824	61	.6184	.5367	108	.6247	2.432	155	.6318	8.534	202	.6400	24.44
15	.6130	.0862	62	.6185	.5559	109	.6248	2.504	156	.6320	8.744	203	.6402	24.95
16	.6131	.0900	63	.6187	.5758	110	.6250	2.578	157	.6322	8.958	204	.6404	25.47
205	.6405	25.99	251	.6499	61.09	297	.6607	130.8	343	.6736	250.9	389	.6890	444.4
206	.6407	26.53	252	.6501	62.17	298	.6610	132.8	344	.6739	254.2	390	.6893	449.6
207	.6409	27.07	253	.6503	61.88	299	.6612	134.8	345	.6741	257.6	391	.6897	454.9
208	.6411	27.62	254	.6505	65.21	300	.6615	136.8	346	.6745	261.0	392	.6901	460.2
209	.6413	28.18	255	.6508	66.34	301	.6617	138.9	347	.6749	264.5	393	.6905	465.6
210	.6415	28.75	256	.6510	67.49	302	.6620	141.0	348	.6751	268.0	394	.6908	470.9
211	.6417	29.33	257	.6512	68.66	303	.6623	143.1	349	.6754	271.5	395	.6911	476.4
212	.6419	29.92	258	.6514	69.85	304	.6625	145.3	350	.6757	275.0	396	.6915	481.9
213	.6421	30.53	259	.6516	71.05	305	.6628	147.4	351	.6760	278.6	397	.6919	487.4
214	.6423	31.14	260	.6518	72.26	306	.6631	149.6	352	.6763	282.2	398	.6923	493.0
215	.6424	31.76	261	.6521	73.50	307	.6633	151.8	353	.6767	285.9	399	.6927	498.7
216	.6426	32.38	262	.6523	74.75	308	.6636	154.1	354	.6770	289.6	400	.6931	504.4
217	.6428	33.02	263	.6525	76.02	309	.6639	156.3	355	.6773	293.3	401	.6935	510.1
218	.6430	33.67	264	.6528	77.30	310	.6641	158.7	356	.6776	297.1	402	.6939	515.9
219	.6432	34.33	265	.6530	78.61	311	.6644	161.0	357	.6780	300.9	403	.6943	521.7
220	.6434	35.01	266	.6532	79.93	312	.6647	163.3	358	.6783	304.8	404	.6947	527.6
221	.6436	35.69	267	.6534	81.27	313	.6650	165.7	359	.6786	308.7	405	.6951	533.5
222	.6438	36.38	268	.6537	82.62	314	.6652	168.1	360	.6789	312.6	406	.6955	539.5
223	.6440	37.08	269	.6539	84.00	315	.6655	170.5	361	.6792	316.6	407	.6958	545.6
224	.6442	37.80	270	.6541	85.39	316	.6658	173.0	362	.6795	320.6	408	.6962	551.6
225	.6444	38.53	271	.6543	86.83	317	.6661	175.6	363	.6799	324.6	409	.6966	557.8
226	.6446	39.27	272	.6546	88.26	318	.6663	178.0	364	.6803	328.7	410	.6970	564.0
227	.6448	40.02	273	.6548	89.71	319	.6666	180.6	365	.6806	332.8	411	.6975	570.2
228	.6451	40.78	274	.6551	91.18	320	.6669	183.1	366	.6809	337.0	412	.6979	576.5
229	.6453	41.56	275	.6553	92.67	321	.6671	185.7	367	.6813	341.2	413	.6983	582.8
230	.6455	42.34	276	.6555	94.18	322	.6674	188.3	368	.6816	345.4	414	.6987	589.3
231	.6457	43.14	277	.6558	95.71	323	.6677	191.0	369	.6820	349.7	415	.6991	595.7
232	.6458	43.95	278	.6560	97.26	324	.6680	193.7	370	.6823	354.0	416	.6995	602.2
233	.6460	44.77	279	.6563	98.83	325	.6683	196.5	371	.6826	358.4	417	.6999	608.8
234	.6463	45.61	280	.6565	100.4	326	.6686	199.2	372	.6829	362.8	418	.7003	615.4
235	.6465	46.46	281	.6568	102.0	327	.6689	202.0	373	.6832	367.3	419	.7007	622.1
236	.6467	47.32	282	.6570	103.7	328	.6691	204.8	374	.6836	371.8	420	.7012	628.8
237	.6469	48.19	283	.6572	105.3	329	.6694	207.7	375	.6839	376.3	421	.7016	635.6
238	.6471	49.08	284	.6575	107.0	330	.6697	210.5	376	.6843	380.9	422	.7021	642.5
239	.6473	49.98	285	.6577	108.7	331	.6700	213.5	377	.6847	385.5	423	.7025	649.4
240	.6475	50.89	286	.6580	110.4	332	.6703	216.4	378	.6850	390.2	424	.7029	656.3
241	.6477	51.83	287	.6582	112.1	333	.6707	219.4	379	.6853	394.9	425	.7033	663.3
242	.6479	52.77	288	.6584	113.9	334	.6709	222.4	380	.6857	399.6	426	.7037	670.4
243	.6481	53.72	289	.6587	115.8	335	.6712	225.4	381	.6861	404.3	427	.7042	677.5
244	.6484	54.69	290	.6590	117.5	336	.6715	228.5	382	.6863	409.3	428	.7046	684.7
245	.6486	55.68	291	.6592	119.3	337	.6717	231.6	383	.6868	414.2	429	.7051	691.9
246	.6488	56.67	292	.6594	121.2	338	.6721	234.7	384	.6871	419.1	430	.7055	699.2
247	.6490	57.69	293	.6597	123.1	339	.6724	237.9	385	.6875	424.1	431	.7059	706.5
248	.6492	58.71	294	.6600	125.0	340	.6727	241.1	386	.6879	429.1	432	.7064	713.9
249	.6494	59.76	295	.6602	126.9	341	.6730	244.3	387	.6882	434.2	433	.7068	721.4
250	.6496	60.81	296	.6604	128.9	342	.6733	247.6	388	.6886	439.3	434	.7073	728.9

The values K and H being given in the table for various temperatures, t, in Fahrenheit degrees, the formulas are:

Weight of 1 cu. ft. saturated steam =

$$\frac{1.325271\ K\ H}{459.2 + t}\ \text{(exactly)}.$$

Weight of 1 cu. ft. saturated steam =

$$\frac{1.3253\ K\ H}{459 + t}\ \text{(approximately)}.$$

H being equal to 2.036 × (gauge pressure + atmosphere pressure, in pounds per square inch).

H, K, and t having corresponding values as given in table.

$$\text{Weight of 1 cu. ft. pure dry air} = \frac{1.325271\ M}{459.2 + t} \text{ (exactly).}$$

$$\text{Weight of 1 cu. ft. pure dry air} = \frac{1.3253\ M}{459 + t} \text{ (approximately).}$$

$$\text{Weight of 1 cu. ft. pure dry air} = \frac{2.698192\ P}{459.2 + t} \text{ (exactly).}$$

$$\text{Weight of 1 cu. ft. pure dry air} = \frac{2.7\ P}{459.2 + t} \text{ (approximately).}$$

M being the absolute pressure measured in inches of mercury.

P being the absolute pressure measured in pounds per square inch.

Letting W = the maximum weight in pounds, water vapor, that 1 pound of pure air can contain, when the temperature of the mixture is t, and the total, or observed, absolute pressure in pounds per square inch is P, the value of W, is

$$W = \frac{K\ H}{2.036\ P - H} \text{ (exactly).}$$

The values of K and H corresponding to the existing temperature being given by the table.

For any temperature the value of K (the ratio of the weight of a volume of saturated steam to an equal volume of pure dry air at the same temperature and pressure) may be accurately computed by the following formula:

$$K = 0.6113 + \frac{0.092\ t}{850 - t} \text{ (exactly).}$$

Note.—The results obtained by the use of any of the above formulas agree exactly with the average data for air and steam weights as given by the most reliable authorities and careful experiments, for all pressures and temperaterus; the value of K being correct for all temperatures up to the critical steam temperature of 689° Fahrenheit.

in all other installations, including those on railways, long radiating pipes should always be employed. Of course it is true that even if the compressed air be cooled to the existing outside temperature, before leaving the main reservoir, some moisture may be deposited in the rest of the system if a drop of the outside temperature occurs, but the amount of water thus thrown out must obviously be small, and it appears merely as little beads on the interior walls of the various devices. It is seldom that any trouble is experienced from this source alone. Moreover, although compressed air may be properly dried before leaving the main reservoirs, some moisture may be temporarily deposited when the air is subsequently expanded to lower pressures, as the moisture-carrying capacity of the air is usually affected more by the drop in temperature, resulting from the expansion, than by the drop in pressure, but when the air again attains the outside temperature, the moisture thus deposited will be re-absorbed if it is freely exposed to the compressed air.

In order to determine exactly what percentage of moisture pure air can contain at various pressures and temperatures, to ascertain how low the 'relative humidity' of the atmosphere must be in order that no water will be deposited in any part of a compressed-air system, and also to find to what temperature air drawn from a saturated atmosphere must be cooled in order to cause the deposition of moisture to commence, the following discussion is necessary, as no correct method has heretofore been published to cover the situation.

In order to obtain the desired information, it is only necessary to remember a well-known physical law which covers the case of most mixed gases with great exactitude, for water-vapor is merely a gas. This law is known as 'Dalton's Law of Gaseous Pressures', and may be stated as follows:

Every portion of a mass of gas enclosed in a vessel contributes to the pressure against the sides of the vessel the same amount that it would have exerted by itself had no other gas been present.

In other words, the total pressure exerted against the interior of a vessel by a given quantity of a mixed gas enclosed in it is the sum of the pressures which each of the component gases would exert separately if it were enclosed alone in a vessel of the same bulk at the same temperature. This law applies to mixtures of pure air and saturated water-vapor, and in order to determine the maximum weight of moisture that can be held in suspension by one pound of pure air at any temperature and pressure it is merely necessary to proceed as outlined below. Letting p_2 represent the absolute pressure in pounds per square inch, and t the temperature Fahrenheit; the weight in pounds of 1 cu. ft. of pure air is known to be equal to:

$$2.698192 \times \frac{p_2}{459.2 + t}$$

Also letting N equal the volume in cubic feet of one pound of pure air at the temperature, t, and pressure, p_2, there results the equation:

$$1 = N \times 2.698192 \times \frac{p_2}{459.2 + t} \quad \ldots\ldots \text{(Equation 1)}$$

Now w, the weight in pounds of 1 cu. ft. of saturated steam (or water-vapor) at the temperature, t, and corresponding absolute pressure, p_1, in pounds per square inch, has been shown by the author to be accurately expressed, in accordance with the average values given by the most reliable authorities, by the following equation, for all conditions:

$$w = \frac{p_1}{459.2 + t}\left(1.6494 + \frac{0.248\ t}{850 - t}\right)$$

and by letting W represent the weight of N cubic feet of saturated steam at the temperature, t, and pressure, p_1, there results the equation:

$$W = \frac{N\ p_1}{459.2 + t}\left(1.6494 + \frac{0.284\ t}{850 - t}\right) \quad \ldots \text{(Equation 2)}$$

By taking the N cubic feet of pure air at pressure, p_2, and the N cubic feet of saturated steam at the pressure, p_1, and forcing them both into one vessel of volume, N, keeping the temperature constant at the value, t, the resulting pressure, by Dalton's law, will be $p_2 + p_1$, which may be placed equal to p, thus:

$$p = p_2 + p_1 \ldots\ldots \text{(Equation 3)}$$

W will, of course, represent the maximum weight of water-vapor that 1 lb. of pure air can contain under the given conditions of pressure and temperature,

as the steam considered is at the saturation point. To obtain the desired formula which will express the value of W in terms of the known quantities it is merely necessary to divide the members of equation 2 by those of equation 1, thus:

$$\frac{W}{1} = \frac{\dfrac{N\,p_1}{459.2+t}\left(1.6494+\dfrac{0.248\,t}{850-t}\right)}{2.698192\,N\,\dfrac{p_2}{459.2+t}}$$

which may be simplified by division to give,

$$W = \left[0.6113+\frac{0.092\,t}{850-t}\right]\frac{p_1}{p_2}$$

but (by equation 3) $p_2 = p - p_1$ and by substituting this value of p_2 in the above equation there results:

$$W = \left[0.6113+\frac{0.092\,t}{850-t}\right]\frac{p_1}{p-p_1}\text{; or,}$$

$$W = \left[0.6113-\frac{0.092\,t}{850-t}\right]\frac{H}{2.036\,p-H}$$

....(Equation 4)

where H represents the tension of saturated steam (or water-vapor) at the temperature, t, in inches of mercury.

In order to simplify matters, the first member of equation 4 may be placed equal to K, thus:

$$W = \frac{K \times H}{2.036p - H} \quad \text{....(Equation 5)}$$

The values of K and H corresponding to all ordinary temperatures, are given in Table I; that is, equation 5 is the desired simple formula which gives the maximum weight, W (in pounds) of water-vapor that one pound of pure air can contain when the total or observed absolute pressure in pounds per square inch is p, and the values of K and H correspond to its existing temperature, whatever its value may be. Table I will also be found of much practical value in other connections by noting that H is simply the absolute pressure of saturated steam expressed in inches of mercury, the absolute pressure in pounds per square inch being readily found for any desired temperature by dividing the values of H by 2.036; also K represents the ratio of the weight of 1 cu. ft. of saturated steam at any given temperature and corresponding pressure to 1 cu. ft. of pure air at the same pressure and temperature.

It is worthy of note, as demonstrated in the preceding discussion, and as proved by numerous experiments, that the ratio just referred to is *not a constant*, but has a different value for each temperature; consequently all of the tables heretofore published in text-books and hand-books which give the relative and total weights of air and water-vapor and of the mixture, and which have been computed on the erroneous assumption that the ratio in question is a constant, are not to be relied on. The majority of the values furnished by such tables are far from being correct. Table II, given in this article, is figured correctly by the use of the exact ratio for each temperature specified, and should prove of value in all moisture computations.

TABLE II.—WEIGHTS, IN POUNDS, OF PURE DRY AIR, WATER-VAPOR, AND SATURATED MIXTURES OF AIR AND WATER-VAPOR AT VARIOUS TEMPERATURES, UNDER NORMAL ATMOSPHERIC PRESSURE OF 29.921 IN. OF MERCURY OR 14.6963 LB. PER SQ. IN. ALSO VALUES OF THE ELASTIC FORCE OR PRESSURE OF THE AIR AND VAPOR WHEN PRESENT IN SATURATED MIXTURES. (Copyright, 1908, by H. M.-Prevost Murphy.)

Temperatures in Fahrenheit Degrees.	Weight of One Cubic Foot of Pure Dry Air	Saturated Mixtures of Air and Water Vapor						
		Elastic Force of the Water Vapor or Saturated Steam in Inches of Mercury	Elastic Force of the Air alone when Saturated with Water Vapor in Ins. of Mercury	Weight of the Water Vapor in One Cu. ft. of the Mixture, or Wt. of One Cu. ft. of Saturated Steam	Weight of the Air in One Cubic Foot of the Mixture	Total Weight of One Cubic Foot of the Mixture	Weight of Water Vapor Mixed with One Pound of Pure Air
0	.086354	.0439	29.877	.000077	.086226	.086303	.000898
12	.084154	.0754	29.846	.000130	.083943	.084073	.001548
22	.082405	.1172	29.804	.000198	.082083	.082281	.002413
32	.080728	.1811	29.740	.000300	.080239	.080539	.003744
42	.079117	.2673	29.654	.000435	.078411	.078846	.005554
52	.077569	.3883	29.533	.000621	.076563	.077184	.008116
62	.076081	.5559	29.365	.000874	.074667	.075541	.011709
72	.074649	.7846	29.136	.001213	.072690	.073903	.016691
82	.073270	1.092	28.829	.001661	.070595	.072256	.023526
92	.071940	1.501	28.420	.002247	.068331	.070578	.032877
102	.070658	2.036	27.885	.002999	.065850	.068849	.045546
112	.069421	2.731	27.190	.003962	.063085	.067047	.062806
122	.068227	3.621	26.300	.005175	.059970	.065145	.086285
132	.067073	4.750	25.171	.006689	.056425	.063114	.118548
142	.065957	6.167	23.754	.008562	.052363	.060925	.163508
152	.064878	7.929	21.992	.010854	.047686	.058540	.227609
162	.063834	10.097	19.824	.013636	.042293	.055929	.322407
172	.062822	12.749	17.172	.016987	.036055	.053042	.471146
182	.061843	15.965	13.956	.021000	.028845	.049845	.728012
192	.060893	19.826	10.095	.025746	.020545	.046291	1.25319
202	.059972	24.442	5.479	.031354	.010982	.042336	2.85507
212	.059079	29.921	0.000	.037922	.000000	.037922	Infinite

Columbite and tantalite are generally confused in this country. A sharp distinction is drawn between them in England and Europe, columbite being a niobate of iron, while tantalite is a tantalate of iron. Between these two $FeNb_2O_2$ and $FeTa_2O_6$, neither of which are ever found absolutely pure, all gradations from one into the other occur, and manganese is generally present, replacing a portion of the iron. Therefore Dana gives the formula $(FeMn)(NbTa)_2O_6$. There is no market for columbite, but tantalite containing 40% or more of the tantalic acid (Ta_2O_5) is saleable on special negotiation. There is no steady demand, but it may be said in a general way that tantalite containing 40% Ta_2O_5 is always worth as much as $100 per ton at tide-water.

THE GENESIS OF THE COPPER ORES IN SHASTA COUNTY, WEST OF THE SACRAMENTO RIVER.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM FORSTNER.

The deposits of copper ore in Shasta county, California, are in the northwestern part of the county. They can be subdivided into two belts, the Iron Mountain belt west, and the Bully Hill belt east of the Sacramento river. In both these belts the ore deposits are in the form of massive pyritic bodies, contained within acidic extrusive rocks. In the Iron Mountain belt are two pre-middle Devonian extrusives, the Copley andesite and the Balaklala rhyolite; the latter containing the copper-ore deposits. The rhyolite is undoubtedly later than the andesite, and the latter may underlie the area covered by the rhyolite. Both were extruded on land. The underlying rocks are probably the older schist-series found in Trinity and Siskiyou counties.

The Balaklala rhyolite consists of various flows which might be differentiated in the underground works by careful study, in order to decide whether the orebodies are confined to one or more flows, or are distributed through the entire rhyolite mass. Although the rhyolite is not homogeneous the following description affords a basis for further discussion. The rock is, throughout, considerably altered. Its principal primary constituents are quartz and orthoclase, occasionally plagioclase. There is also an entire absence of femic minerals. The secondary principal constituent is quartz, and the secondary accessory constituents are pyrite, calcite, sericite, and kaolin. At a distance from the orebodies the pyrite generally occurs in small aggregates of minute grains, occasionally forming bunches, which latter generally consist partly, if not principally, of chalcopyrite. Well-developed cube pyrite is very rare. Close to the orebodies the country rock becomes pitted, and the cavities are to a greater or less extent filled with pyrite, until the material changes into massive pyrite, with small inclusions of quartz. The transition zone is generally from one to two inches wide. D. F. Campbell, in the MINING AND SCIENTIFIC PRESS, January 5, 1907, p. 28, mentions the presence of mica and chlorite, the latter often in such quantities as to give a dark-green color to the rock. I presume his specimens were collected near Iron mountain. In none of my specimens, collected between Motion and Backbone creeks, was chlorite detected microscopically. Possibly the green phases of rhyolite represent the Copley meta-andesite, which contains considerable chlorite.

The orebodies consist of massive aggregations of grains of pyrite with accessory chalcopyrite. These sulphides have entirely replaced the feldspars, and also part of the quartz of the country rock. Rhyolites contain from 21.8 to 47.8% quartz (Prof. Paper No. 14, U. S. G. S.), while generally the ores contain about 5% silica, consequently a replacement of quartz by sulphides must have taken place on a large scale. A similar case occurs in Butte, Montana, where the quartz of the granite, which is chemically analogous to rhyolite, is removed, resulting in large masses composed entirely of metallic minerals (S. F. Emmons, *Trans.* A. I. M. E., Vol. XVI, p. 57). Neuman considers this replacement to be a chemical process, the removal and deposition proceeding simultaneously, molecule for molecule ('Genesis of Ore Deposits', p. 502). Sulphides of iron, copper, zinc, etc., are soluble in alkaline sulphide solutions, and also in alkaline carbonate solutions containing hydrosulphuric acid (Van Hise, *Mon.* No. 47, U. S. G. S., p. 1106). There is little to be found in the literature of the genesis of ore deposits concerning the action upon quartz of solutions containing alkaline sulphides or carbonates, and carrying dissolved metallic sulphides, sulphites, and sulphates. As the orebodies were formed within fractured portions of the country rock, they were formed within the zone of katamorphism, and below the belt of weathering, consequently in the belt of cementation. The principal reactions in the lower part of this belt are cementation and metasomatism. The cementing substances are oxides, carbonates, silicates, and sulphides. Of the former, silica is the most important. In this case the composition of the circulating waters must have been such as to produce extensive metasomatism, causing the dissolution of the feldspars and most of the quartz of the rhyolite, and their replacement by metallic sulphides.

Our imperfect knowledge of the chemical activity of thermal waters under the influence of high temperature and pressure is yet an obstacle to the clear understanding of their work in depth. Chemists agree that silica generally exists in the hot mineral waters in a colloid solution; and consequently does not diffuse through the rock-walls, which form semi-permeable membranes (W. Lindgren and F. L. Ransome, Prof. P., No. 57, p. 220; and others). The thorough elimination of the rock constituents, mainly feldspar and quartz, shows that alkali and calcium carbonates and an excess of carbon dioxide were present. The presence of calcium carbonate is probable, as calcite replaces quartz, which is dissolved by waters containing alkaline carbonates, a corresponding quantity of calcic carbonate being deposited in its place ('Genesis of Ore Deposits,' p. 525). Sericite, with free silica and potassium silicate, result from the decomposition of orthoclase by the action of water alone at high temperature and under pressure ('Geochemistry', p. 511); it also forms from quartz, in which case a complex chemical action is probably involved, a transportation of potash and alumina must be assumed ('Genesis of Ore Deposits', p. 528). It must be kept well in mind that the solutions necessarily must have been very dilute. Alkali carbonates at high temperatures are readily soluble in water; at 135° C. 100 parts of water dissolve 205 parts of K_2CO_3, and at 105° C. 45.1 parts of Na_2CO_3; calcium carbonate, however, requires a great amount of water. At 21° C. it takes 1015 parts of water saturated with carbon dioxide to dissolve one part of $CaCO_3$. Silica also requires considerable water; it is soluble in 1000 parts of pure water. When precipitated from alkaline silicates, by water saturated with carbon dioxide, one part of silica requires about 5000 parts of water; but if the silica is set free in

sufficient water to retain the silica, one part of silica can thus be held in solution by 100 parts of water.

As stated above the ore deposition took place in a zone of fracturing of the rhyolite, in the lower portion of the zone of katamorphism; the fissures through which the waters circulated were most probably exceedingly minute, the chemical action of substitution must have taken place very slowly, and it may be accepted that the entire deposition covered a long space of time. The microscopic study of the material of the orebodies and of the immediate wall-rock confirms this view, as in some specimens the pyrite is crushed, while in others such is not the case, indicating that movements had occurred in the intervening time. It then appears probable that the deposition of the orebodies was the result of a double process, first, a replacement of the feldspars and silica by means of alkaline carbonates and carbon dioxide, and then a replacement of the alteration-product by metallic sulphides by means of alkaline sulphides and hydrogen sulphide. The iron content of these solutions must have been derived either from the underlying strata, or from the residual magma, femic minerals being absent in the Balaklala rhyolite. It must be remarked that, as yet, no bodies of copper ore have been found in the Copley meta-andesite, although it is a locus of many gold-quartz veins, among which are those at Old Diggings. At the head of Motion creek, on the line of the Iron Mountain copper-belt I have found some highly altered rock, most probably derived from basic rock; this may give a lead, especially considering that the pyritic ores at Black Diamond are close to serpentine and diabase, and those at Bully Hill to basalt.

In the orebodies under discussion the pyrite is found occasionally surrounded by narrow rims of quartz, but is not associated with chlorite or epidote. The rocks have not been metamorphosed to such an extent as to justify the assumption that dynamo-chemical metamorphism has taken place, and we are thus brought to the conclusion that the orebodies were formed by hydro-thermal processes, that is, by the action of ascending thermal waters (W. Lindgren, 17th. Ann. Rep. U. S. G. S., pp. 90 to 95). The form and the size of the orebodies vary greatly; some are lenticular, others have a more tabular form. Some have been entirely eroded, leaving only the outline of part of their walls as testimony to their former existence; of others only a relatively small residual mass of limonite remains. They must have formed in zones of intense fracturing of the country and were most probably limited by subsequent cross-movements, which by attrition caused impervious belts whereby the circulation of the solutions was circumscribed within certain portions of the zones of fracturing (R. H. Sales, *Economic Geology*, Vol. III, p. 329). These may be contraction-fractures, or they may have been caused by dislocation of the strata. I am inclined to believe that the original fractures, wherein the ore deposits formed were contraction-fractures, while the fractures which caused the formation of impervious clayey strata, in many cases limiting the orebodies, were the result of earth-movements. The latter, however, were not limited to the period of ore deposition, but persisted afterward, as proved by the faulting of some of the orebodies.

THE PASSING OF THE TAILING-WHEEL.

*The tailing wheel, that familiar object on the landscape at the Rand, has long been threatened and is now quietly passing from our midst. For a long time the mechanical engineers of the various groups of mines—notably A. M. Robeson, of the Corner House—were experimenting with various forms of elevators and pumps, but the actual displacement of the tailing-wheel can now for the first time be chronicled.

It has been ousted by an improved type of centrifugal-pump, evolved after lengthy and careful experiment by the mechanical engineering department of H. Eckstein & Co., to whose initiative Rand metallurgical practice owes so much. The history of the experiments is interesting. When the tailing-wheel of the Rose Deep broke down last year a centrifugal-pump was used temporarily to replace it. A fatal flaw in the centrifugal-pump was found to be the speed with which the manganese steel liners wore out, and also the large waste of power. These were eventually overcome by replacing with locally-made cast white-iron liners, and by intelligent design, with such satisfactory results that the general adoption of this device is now only a question of time. In operating costs the centrifugal-pump possesses no advantages over the tailing-wheel; but in capital expenditure or prime cost, a marked saving is effected. The cost of a pair of pumps is, roughly, £1780; the usual cost of a tailing-wheel is £8000. For small equipments the difference in favor of the centrifugal-pump becomes more apparent than for larger ones.

The centrifugal-pump is notoriously inefficient, but its failings in this respect are greatly exaggerated. With sand the average efficiency is 40 to 45%, and it is hoped to obtain an efficiency of 50%, which nearly approaches that of modern high-lift centrifugal-pumps. The centrifugal-pump has already displaced the tailing-wheel at the Rose Deep and the Crown Deep, at both of which mines the tailing-wheel has now been finally 'scrapped.' At the New Heriot a plunger-pump has been scrapped in its favor. At the Village Main Reef, one has been erected as a stand-by, and two pumps are being erected at the Glen Deep and two at the Durban Roodepoort Deep. At all the mines that have adopted the pump, duplicates will be erected. It is noteworthy that the life of a tailing-wheel averages only 12 years, and many of the wheels on the outcrop-mines and first row of 'deeps' are now nearing their end.

Radium exists in the sea water around the coast of Ireland in special abundance, according to some experiments recently carried on. The deep-lying sediments of the ocean were found to be exceptionally rich in this metal.

Nitro-glycerine freezes at 42 to 46° Fahrenheit, but is not entirely safe even when frozen.

* Re-print from *The South African Mining Journal*, June 6, 1908.

THROUGH THE BOLIVIAN HIGHLANDS.

Written for the MINING AND SCIENTIFIC PRESS
By E. P. MATHEWSON.

(*Continued From Page 228.*)

Next morning a special mixed train goes a few miles up grade to Pulacayo, where the famous silver mine of that name is situated. Here is a great settlement dependent entirely on the mine and ruled with a rod of iron by the officials of the company.

The main entrance to the mine is by a tunnel which is lined in dangerous places with cut stone. The tunnel goes entirely through the mountain, a distance of about two kilometres, and the main shaft has its collar on this level. The ore comes out on the Pulacayo side, where it is hand sorted by women, making three grades as follows: No. 1, shipping ore, carrying 75 oz. or more of silver, which is sent to the United

Ancient Stone-Hammer Used in Mining.

States; No. 2, smelting ore for Playa Blanca, carrying 60 oz. or over; and No. 3, amalgamating ore of less than 60 oz., treated at Huanchaca. The ore is all shipped in bulk. It contains considerable quantities of zinc and sulphur, a little copper, antimony, arsenic, and some lead, but its chief value is in the silver.

The mine is in charge of American and French mining engineers and is kept up in good shape. It is expensive pumping and hoisting with coal at twenty dollars per ton, and at an elevation of 15,000 ft. Electric power has since been introduced. The lower levels are hot, and the mine water is also hot, and the ground shifts and squeezes considerably. The ore is chloridized in hand roasters fired with *taquia*, followed by pan amalgamation. The plant was re-

Women Ore-Sorters, Pulacayo, Bolivia.

modelled by the late Arthur Wendt, after the style of the Butte, Montana, silver mills.

The journey from Uyuní to Oruro is not very interesting. The road is laid on the pampa or high plateau. At times one passes close to the mountains, and at Poapo, near the great lake of that name. At Challapata is seen tin concentrate ready for shipment to Europe, and near Oruro the dumps from prospect holes for tin are visible from the train. At Machacamarca is a little establishment for tin and silver separation. The ore is finely broken by women

Sica-Sica, Bolivia.

with hammers, then roasted with salt in adobe furnaces, then leached and the silver precipitated as sulphide. The leached ore is then concentrated for tin in hand jigs, the concentrate or *barilla* running up to 75% tin.

Oruro is a regularly built town on slightly rising ground, at the base of a round hill in which is the famous San José silver-tin mine. Oruro was the terminus of the railway for years.

I visited the site of the old Catalan forge used by the Spaniards 300 years ago. It stands on the side of the hill in which the San José mine is situated.

Plaza in Oruro, Bolivia.

There were the remains of 13 furnaces, the slag amounting to several thousand tons, averaging, by analysis of a sample, Pb, 31.83%; SiO_2, 30.0; CaO, 1.8; Fe, 10.0; Al_2O_3, 3.0; Sb and Sn, 3.5; S, 1.2; and the silver content was 15 oz. per ton. This slag was being shipped to the Playa Blanca smelter at Antofagasta for its lead and silver contents. The Spaniards scorified the lead until it was all removed as slag and there remained a plate or *plancha* of silver, which they cooled in the furnace and afterward cut up with chisels. The early coinage in Peru (at that time including what is now Bolivia), was made from long bars of silver chiseled from the plates above mentioned, roughly rounded by hammering, then cut off and trimmed to weight and stamped with a cross, the arms of Spain, and the date. Some of this old money is still to be obtained in Bolivia and Peru by inquiry for *moneda antigua plata Cruz*. The San José mine is owned by Bolivians and Scotchmen. It

has produced large quantities of silver in its day. There are now competent European mining engineers in charge who are introducing modern methods of mining and concentrating. The ore is hoisted in rawhide buckets, pounded up on anvils by Indian women using small hammers, sorted into first and second class, and the second class concentrated on hand-jigs and Wifley tables. The mine is on the side of the hill farthest from Oruro, but the old Spanish workings were on both sides and are shown in back of the church.

The trip from Oruro to La Paz was made in a special coach drawn by four mules, and driven by a young Scotchman only a few months out from the old country. The springs of the vehicle were wound with rawhide. The mules were changed at regular intervals, but no attempts were made to have harness to fit the different mules, the same sets going right through, and many of the mules were severely chafed by the misfitting collars. The road is fairly level, but is covered with small stones which are used to advantage by the llama drivers in their slings. These llama drivers, and in fact, all Bolivian Indians, men, women, and children, carry slings and use them with great accuracy. They turn the llamas with them as a cowboy turns his herd of cattle with his revolver. They fight with them also, and during a recent revolution they did great execution. The Bolivian Indian is peculiar in his ideas of honesty. If you contract with him to freight valuable goods, say from the mountains to the coast, a distance of 300 miles, he will carry out his contract to the letter and deliver everything to the last pound in good order. If you allow him to enter your house or camp he will steal anything he can lay his hands on without the least idea that he is doing wrong. He is fond of music and has several peculiar musical instruments. One is a very long flageolet made of bamboo; another, a kind of guitar, the back of which is usually the shell of an armadillo.

Some religious celebrations seen on the journey to La Paz were very interesting. The men and women dress up in amazing costumes, and perform all kinds of fancy dance-steps. Of course some alcoholic refreshment is furnished, with the usual result. The men have a peculiar head ornament which they regard with as much veneration as a freshman does his first dress suit. It is made of long feathers like peacock tail feathers, the quills fastened in a band to fit about the head. The feathers tower straight up from the head three feet or more, opening out a little like an umbrella upside down. This head dress is worn only on solemn occasions, such as these feast days. The women dress in tights and wear wonderful bonnets.

First night out is passed at Sica-Sica. What it means I cannot say, but it is the plural of Sica. Many words in South American Indian languages form their plural by duplication. Sica-Sica is a little adobe village with a public square, absolutely bare. In hunting about the village I came across some curious ponchos, silver spoons, maté pots, and one peculiar pestle and mortar. Maté is a favorite drink in South America. It is made by steeping the leaves of the yerba maté in hot water and adding a little lemon rind for flavor. It is taken through a tube, with strainer on one end to keep out the leaves, called a *bombilla*, or little pump. The taste is decidedly herbaceous. The Bolivians always carry a stimulant in the form of coca leaves, from which the cocaine of pharmacy is obtained. These leaves they carry in a little pouch with some alkaline paste hardened into a cake. They chew the leaves with the alkali just as tobacco is chewed. There are many theories as to the action of the cocaine in the system when taken in this manner. The drug takes away the desire for food, at the same time stimulating the muscular system so that great tasks can be performed without fatigue. Certain it is that these people eat very little during long journeys, and they climb mountains at great elevations without difficulty.

All Bolivian Indians, men, women, and children, carry with them a kind of spinning wheel, with a long stem. They pull wool from the llamas as they need it and set the little wheel spinning thread at every convenient stop. Some are so expert that they can spin the thread while walking along. In some parts they have little clay saucers in which to spin the little wheels.

La Paz is in the bottom of an arroyo a mile wide

'Cruz' Coins, Colonial Period.

and 1000 ft. deep. It is a good sized city with red tiled houses. In sight of the town are some of the highest peaks of the Andes: Sorata, 21,500 ft., and Illimani, 21,030 ft., snow-capped all the year round. There is a pass at the side of Sorata that is 17,000 ft. above sea-level. An interesting gold placer country lies to the east and west of Sorata. American capital is engaged in gold mining in both districts. There is a quaint hotel in La Paz, overlooking the main plaza. It must have been built over a hundred years ago. The walls are several feet in thickness and resemble those of a fortress. We met here Professor and Mrs. Bandalier, who had spent several years on the Island of the Sun in Lake Titicaca, studying the Inca remains. Professor Bandalier had made numerous trips for the American Museum of Natural History of New York, and his collections are included in the Peruvian section of the museum.

There is a tribe of Indians chiefly in the neighborhood of La Paz called the Aymaras, totally distinct from the Quichuas that occupy the greater part of Bolivia and Peru. The Amaras are said to be cannibles, and stories were told of their sucking blood from dying men after the big battle of the revolution of 1899.

The men dress in dark blue homespun cloth suits, consisting of tunic and trousers, the latter somewhat

resembling the Zouave costume. They have the cloth cut away back of the calves of the legs in a V shape, the V being filled loosely with muslin. This is to give freedom to the limbs in walking and running. They wear a kind of toque, usually red in color and much resembling the toque worn by the French Canadian *habitant*.

The Aymaras are supposed to be descended from a tribe that occupied the territory prior to the advent of the Incas.

There are many curious things to be seen in the markets and stores of La Paz, such as rubber 'biscuits' from across the range which are shipped to La Paz and transshipped to Europe or the United States; coffee of Yungay, said to be the best in the world; peculiar fish somewhat like brook trout that are taken in Lake Titicaca. Along with these are German aniline dyes which are rapidly replacing the permanent colors of the natives; German shawls which the Indians like better than their own homespun, and other imported articles. The German outdoes the English and Americans as traders in foreign countries. The foreigner has his own notion of what he wants, and the German will get it for him exactly as he wants it; and at any price he may name. The Englishman thinks he has a reputation to sustain. His father and grandfather made a certain style and quality of goods, so he cannot think of supplying a different article. The American has certain standard patterns, sizes, and prices, and of course he is too busy to change styles for every customer. Is it to be wondered that the enterprising German gets the cream of the foreign trade?

La Paz, Bolivia, from Edge of Plateau.

The stage ride from La Paz to Puerto Perez, the only port of Bolivia on Lake Titicaca, is not long, but it is peculiar. The driver of the rickety vehicle has no whip, but instead he has a small boy as assistant who gathers a sackful of stones. These are thrown at the mules whenever the driver wishes to encourage them to fresh exertion. The stage reached Puerto Perez in the midst of a heavy thunder-storm late in the afternoon, and after a little rest and an inferior meal at the little hotel, I took passage on the small steamer that went during the night diagonally across the lake, a distance of 80 miles, to Puno, in Peru. The night was beautiful, and fortunately there was not much wind, otherwise my impression of steamboat travel on the highest navigable water in the world would have been different. They said that it was frequently very rough, and if one became seasick it was a serious matter, owing to the difficulty in breathing the rarefied air at an altitude of 12,500 feet. The first steamer for Lake Titicaca was built in Scotland and brought over in sections. It was packed on mule-back from the coast to the lake before the railway was built to Puno. It took three years to get all the pieces up from the coast. The later boats came in sections of larger size by rail. I arrived at Puno, Peru, in the early morn-

Street in La Paz.

Aymara Water Carrier, La Paz.

ing, and it was a perfect day. On nearing the landing places I noticed many native canoe-like rafts built of reeds tied in bundles and shaped very like the birch bark canoes of the North American Indians. These canoes had sails of reeds also. Mt. Sorata looms up to the east in grand style, showing its white cap far above the rest of the range. The customs officers inspected the baggage, but gave little annoyance.

Puno is distinguished for several things. It has the highest cathedral in the world, 12,540 ft. above tide. It has torrential rains, so the cobble-paved streets are sunk a couple of feet below the sidewalks, and stone-arch crossings are made at intervals. Hence cart travel is out of the question. The copper from Coro Coro is shipped up the Desaguadero river to Lake Titicaca, and thence to Puno, where it is loaded on cars for the coast.

The ride from Puno to Arequipa is a novel experience. After leaving Puno the grade is ascending until the summit, Crucero Alto, 14,666 ft. above sea, is reached; then a rapid descent is made to Arequipa, 7550 ft. The railway cuttings, through what looks

Old Aqueduct, Arequipa, Peru.

like volcanic ash, resemble the cuttings in snowbanks, excepting that the color is light buff, instead of white. The marks of the shovels are exactly the same. At one point in the descent can be seen four different levels of the track below, thus showing the tortuous nature of the construction. Near Arequipa is seen the Misti, a beautiful volcanic cone on which Harvard University has established an observatory which it has maintained for many years. Arequipa is famous for its religious festivals and for its churches; also it is noted for earthquakes, of which it has a constant supply on hand. In the 'Grand Hotel Central' I found many evidences of earthquakes in the building. It seems that the last great earthquake knocked down the upper stories of all the houses in the city, and the people were too poor to re-build, so they simply roofed in the lower stories and contented themselves with smaller houses. In many parts of the city the ruins of old walls are visible. As in most South American towns, there is a Foreign Club, where one meets all the prominent merchants and railway officials. Visitors are welcomed and treated royally.

On the outskirts of Arequipa are signs of agriculture, but the land is very uneven and hard to cultivate, and the supply of water for irrigation is limited. The train passes closely by an ancient aqueduct not far from the town, plunges through a canyon and then out on a sandy plain, from which point the journey is practically through a desert.

The port of Mollendo is a misnomer. It is only an anchorage exposed to the prevailing winds and swell. It is frequently so rough that the vessels have to wait over a day to land passengers. The following day I boarded the steamer, one of the Pacific Steamboat Navigation Co.'s fine boats, and proceeded south toward Antofagasta. To give an idea of the difficulties of securing laboratory supplies in this part of the world, this incident is worth recording. Acids in Winchester bottles are shipped to the West Coast from Europe. The cases containing the bottles are always carried on deck. If the slightest leak shows in the package the whole case goes overboard. I saw thrown overboard, at Mollendo, several cases of acid because one bottle had evidently broken and the leakage from it had stained all the other packages. The coast steamers are very comfortable; the cabins are large and the staterooms spacious. The meals on the Pacific Steam Navigation Co.'s boats are in the

Caleta Buena, Chile.

English style. Those on the Chilean line are also good, but in Chilean style, to which the average American takes some time to get accustomed. Traders occupy the space between decks with a mixture of bananas and oranges from Guayaquil; chickens, turkeys, ducks, eggs, vegetables and fruits, baskets, embroidery, wooden kitchen utensils, and confectionery. The whole northern part of Chile from Huasco to Arica, including the thickly settled portion about Iquique, has to be supplied with everything eatable for man and beast by the steamers and their traders. The steamers usually travel at night and make a port or anchorage in the morning. There is no port on the west coast at which the steamers tie up to a wharf except Callao. Even Valparaiso is only an anchorage.

At Arica appears the famous hill over which the Chileans drove the Peruvians during the last war. With the aid of a powerful glass one can see at this point the remains of the good ship *Watterree*. This old style United States gunboat was carried a mile inland when the great tidal wave did so much damage along the west coast. She was dropped right side up without injury on the pampa. The sailors went on with their regular duties for some weeks until another United States vessel came along and

took them off, together with the valuable part of the equipment.

Another port of interest is Caleta Buena, from which much nitrate of soda is shipped. The coast range back of which the nitrate is found comes to the water's edge at this point. The nitrate is lowered in three stages by balanced elevators to the little strip of a town at the foot of the hill, and there put in lighters and sent out to the ships.

The next stop is Iquique, where one can go ashore and get a meal at the cozy little resort, a mile out of town, called Carvancho. The features of Iquique harbor are the forty or more sailing vessels always at anchor there, and the great flocks of pellicans on the rocks near the shore. Iquique is the greatest nitrate port in the world. There is a railroad running to the Pampa and extending north and south to reach all the nitrate *oficinas*. There has been so much nitrate spilled about the streets of Iquique that in case of a serious conflagration they have to be careful that the dirt of the street does not catch fire. Nitrate is a dangerous cargo, for if mixed with a little carbon, such as coal dust left from a previous cargo and a light applied, nothing can save the vessel.

The next stop of importance is Tocopilla, where a little copper ore is loaded for the smelters at Antofagasta. Finally the steamer reaches Antofagasta, where I bid farewell to the captain and other good friends on board, take to the whale boat and cross the bar, escaping a ducking only by the good judgment and skill of the boatmen.

Arequipa, Peru, with Mt. Misti in Background.

The purification of bauxite for aluminium manufacture is the subject of a recent French patent. According to this method crude bauxite is powdered and dehydrated, and mixed while hot with boric acid or a borate, preferably borax (about 8%), and a quantity of carbon sufficient for the reduction of the iron and silicon contained in the bauxite. The mixture is fused in an electric furnace, the iron and silicon being reduced and forming compounds with borax, while the alumina is merely melted. The fused oxide is then run into a second furnace, or into another part of the first furnace, where it is reduced to alumina as usual.

Cement Engineering.—The department of Geology and Mining of the University of Arkansas, at Fayetteville, Arkansas, will offer next fall a four years' course for the degree of Bachelor of Science in Cement Engineering. Besides general engineering and geology, special work extending over two years will be given in the geology, occurrence, examination, and testing of cement materials and in the designing and operation of cement plants. In addition to the nearness of well-equipped plants in the Kansas gas district, the University is especially well situated for this work, since in the immediate vicinity of Fayetteville are well-exposed outcrops of limestone and shale, suitable for making portland cement. Students will be expected to sample these as thoroughly as possible and to make all necessary analyses in the chemical laboratory, and finally to prepare an outline design of a cement plant to utilize one of the more valuable deposits. At least two months' actual work at a cement plant will also be required before the degree is granted.

Coal production in Ohio during 1907, as given in an advance chapter from the Mineral Resources of the United States, is summarized as follows:

	1906.	1907.	Increase, %.
Coal (tons)	27,731,640	32,142,419	15.9
Value	$30,346,580	$35,324,746	16.4
Total men employed	45,438	46,833	3.1
Average number of working days	167	199	19.2
Production per man per day (tons)	3.65	3.45	*5.8
Total production per man (tons)	610	686	12.4
Death rate per 1000		3.27	

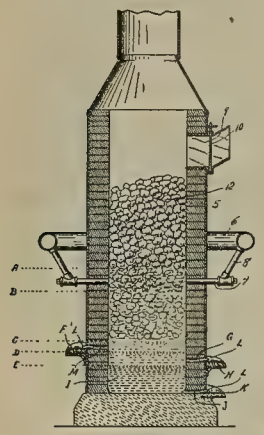
*Decrease.

A paint which will indicate excessive heat in machine parts has recently been put on the market. The normal color is red, but when the painted part becomes heated it turns black, the red appearing again when the temperature falls. The paint is said to be made by mixing mercuric iodide and cupric iodide with distilled water in proportions which vary with the temperature which it may be desired to indicate.

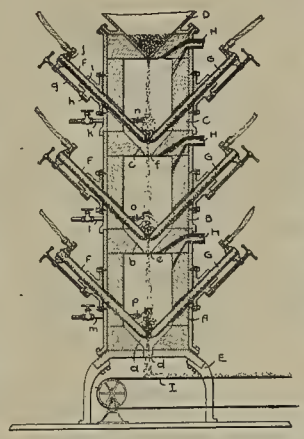
MINING AND METALLURGICAL PATENTS.

Specially reported for the MINING AND SCIENTIFIC PRESS.

SMELTING PROCESS.—No. 894,111. James H. Boyd, Denver, Colorado.



No. 894,111



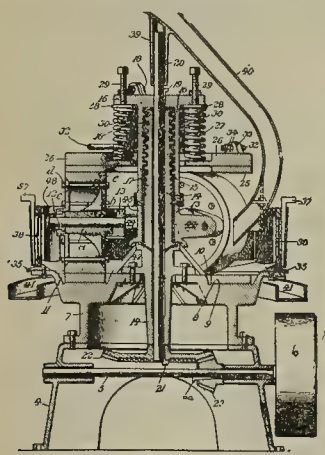
No. 895,196

The herein described sulphide ore smelting process consisting in the separation of the sulphur from the fused ores in the space or zone of the furnace below the fusion zone, by bringing the ore matte in contact with the carbon of the coke, out of contact with the air-blast, whereby the sulphur is removed in the form of sulphide of carbon, leaving the lead, gold, and silver in the metallic state and the copper as matte, substantially as described.

PROCESS OF TREATING ORE.—No. 895,196. James H. Reid, Cornwall, Ontario, Canada.

The herein described process of treating ore, which consists in passing the ore in a continuous stream through a number of electric arcs, introducing reagents while under the action of the said arcs, independently and withdrawing separately, the volatile products freed by each arc and independently treating the different volatile products after withdrawal.

ORE-CRUSHING MACHINE.—No. 893,540. Frederick B. Pettengill, Burbank, California.



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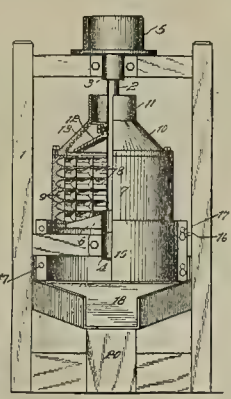


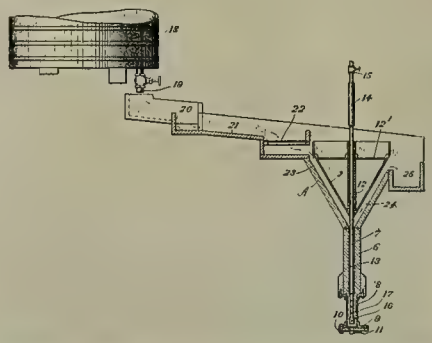
No. 894,632

In an ore-crushing machine, the combination of a non-rotating bottom track frame; a track on said frame; an upper track frame; a track on the under side of said upper track frame; crushing rolls between said tracks; a hollow vertical shaft secured to said bottom frame and passing upwardly therethrough, the upper end of said shaft having annular grooves therein; a spring frame surrounding the upper portions of said hollow vertical shaft and having annular lugs projecting into the annular grooves of said vertical shaft; a plurality of springs between said upper track frame and said spring frame; means secured to said spring frame for varying the tension of said springs; draft connections between said spring frame and said upper track frame; and means to rotate said spring frame.

GOLD SEPARATOR AND AMALGAMATOR.—No. 894,632. Charles H. Hall and John Eldridge, Astoria, Oregon.

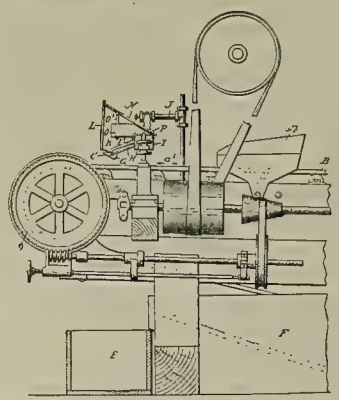
In an apparatus for separating and amalgamating metals, a hollow, vertically journaled, substantially cylindrical and revoluble barrel or chamber with annular horizontal grooves in its inner surface to retain mercury by centrifugal force, vertical partitions fitting said grooves, an upwardly convergent hood fixed to the top of the barrel, with an open top, said hood having interior horizontal, annular grooves, a cone fixed to and revoluble with the cylinder shaft, said cone having a less angle than the hood, radial vanes fixed to the cone with their outer edges in close proximity to the interior of the hood, a source of supply at the top of the hood, and a receiver and discharge beneath the apparatus.

PULP-CLASSIFIER.—No. 895,092. Alfred G. Kirby, Goldfield, Nevada.



A classifier having in combination a casing provided with convergent sides, a narrow hopper at the bottom of said casing and communicating therewith, a sorting column forming a continuation of the bottom of the hopper, a wedge-shaped deflector in the casing having its sides substantially parallel with the inner sides of the casing and separated from the latter to form a sinuous passage for the pulp undergoing classification, and a water supply passing through the deflector and hopper into the sorting column.

ORE-CONCENTRATOR.—No. 893,985. Gilbert H. Davidson, Morenci, Arizona.



An ore-concentrator comprising an endless traveling apron inclined upward in the direction of its motion, means for spreading ore on the apron, and means for discharging a transverse sheet of water onto the belt at regular intervals in the direction of movement of the belt, and in front of the spreading means.

Motor-Driven Cable Reel.

At the Lackawanna colliery of the Temple Iron Co., Olyphant, Pa., has recently been installed, by the General Electric Co., on a 6½-ton 'gathering-locomotive,' a motor-driven cable reel. This appliance exemplifies the latest development in gathering-locomotives, and is a distinct advance over the former methods of reel-drive wherein the reel is driven by means of chain and sprocket from the locomotive axle or armature shaft. In this new method the reel is driven by a small series-wound vertical motor, the frame of which forms a support for the reel proper, which, in common with all General Electric reels, rotates in a horizontal plane on top of the locomotive. Double reduction-gearing is used, the lower end of the armature shaft carrying a pinion which engages with a gear, mounted on a vertical shaft, provided with a special oilless bearing supported by a cast housing on the motor frame. The upper end of this intermediate shaft carries a pinion which engages in a solid plate-gear onto which the reel disc is bolted. Ball-bearings are used throughout, both for upper and lower armature-shaft bearings and also for the reel, ball races being cut in the top of the motor-frame and on the under side of the reel gear-plate. The whole mechanism is simple and compact, and consists of few parts, none of which are subject to hard wear. Renewals are consequently infrequent.

The motor is connected directly across the line with a

resistance permanently in series in the circuit for preventing excessive flow of current. This circuit is controlled by a small single-pole switch, which may be opened when the locomotive is taking current from the trolley-pole and when the reel is not in use. The capacity of the motor is such that it may be stalled on the line indefinitely without overheating. The action of this series-motor is analogous to a spiral spring of infinite length and constant torque. With the locomotive standing still the motor will draw the cable taut, and exert a steady tension on it. When the locomotive moves forward and slackens the cable, the motor instantly starts rotating and reels in the cable. Its tendency at all times is to produce a peripheral speed at the rim of the reel that is higher than the linear speed of the locomotive, so that there is a constant tension on the cable which insures its being wound compactly. When the locomotive changes direction, and unreels the cable, the motor becomes a series generator, and has sufficient counter-torque to produce a tension on the cable that insures its paying out evenly along the road-bed. The braking-effect of this counter-torque is also sufficient to bring the reel to a stop the instant the locomotive stops.

This reel was installed some five months ago and has been in highly successful operation ever since. Its action is entirely automatic, and the absence of shifting levers and other auxiliary apparatus renders it popular with the motormen. Beyond applying a little grease occasionally to the bearings, no other attention is required. The fact that the reel-drive is independent of any movement of the locomotive parts is an important feature of its operation. When, as frequently happens with the locomotive running down a heavy grade, the brakes are set hard enough to skid the wheels, there is no danger of running over the cable. With former methods of axle or armature-shaft drive, any skidding of the wheels of course stops the reel-rotation, resulting almost invariably in cutting the cable. A rather interesting feature of the adaptability of the motor-driven reel is illustrated by the manner in which it is now being operated by the Temple Iron Co. They have a portion of their workings in which no trolley-wire has as yet been strung, but a feed-wire supplying power to another part of the mine runs along the roof. A point on this feed-wire is bared and the cable hooked thereon. The locomotive then runs ahead and stops when the entire 600 ft. of cable is unreeled. The cable is then unhooked, and a short jumper-wire connected to the feed-wire at the point where the locomotive has stopped. The reel-motor is then thrown into circiut, and when all the cable has been reeled in, it is again hooked to the feed-wire at this point, and the locomotive proceeds for another 600 ft., and so on indefinitely.

Pacific Coast Borax Co.'s $500 Prize.

A committee consisting of Isakovics, Roeber, and Baekeland, appointed to draw up the regulations governing the competition for the award of the Pacific Coast Borax Co.'s prize of $500, submitted the following report: The sum of $500 has been paid to The American Electrochemical Society, and deposited in trust, as a research fund, to be awarded as a prize, under the following conditions:

The Pacific Coast Borax Co. desires to awaken an interest in research work and experiments which may lead to some improvement in the commercial method of manufacturing ferro-boron, by a direct process from colemanite. It is essential that the process should be sufficiently economical and suitable to be applied on a large scale, so that the finished product may be available for commercial purposes. Commercial ferro-boron, as now made, contains 20% or more of boron, less than 3% of carbon, and sulphur and phosphorus are practically absent. The prize has been deposited with The American Electrochemical Society, with the request that the board of directors award the same for the best practical solution of the problem, under reasonable conditions, to be decided upon by the Board of Directors. In accordance with the above, competitors for the prize are notified that they must comply with the following conditions:

1. The treatise on the subject must be in typewritten form and accompanied by a sample produced by the process described.

2. The competition for the prize is open to any one and is not restricted to members of the society. The treatise on the subject must be enclosed in a plain, sealed envelope, not bearing the author's name, but identified by a pseudonym. The outside of the envelope, containing the paper, must be labeled with the pseudonym, and with it should be sent another plain sealed envelope, also labeled with the same pseudonym, which should contain inside the envelope, the name and address of the competitor. Both these envelopes should be sent to Prof. Morris Loeb, 273 Madison Avenue, New York City.

3. All papers competing for the prize must be in the hands of Prof. Loeb before October 1, 1909. Prof. Loeb shall retain the small sealed envelope, containing the address of the competitor and forward the large envelope containing the treatise, as well as the sample of the product, both merely labeled with the pseudonym, under cover, to the secretary of The American Electrochemical Society, to be submitted to the Board of Directors, who will award the prize. In this manner, as the treatise must be typewritten, the Board can act with entire impartiality and the paper shall be judged on its own merits, so that the author's standing can have no influence whatever on the decision. The competitors for the prize forfeit none of their property rights in the process submitted.

4. As soon as the Board of Directors has agreed upon the best treatise, it will request from Prof. Loeb the address of the author thereof, who will then be required to demonstrate his process, before the prize will be finally awarded.

5. The Pacific Coast Borax Co., 100 William Street, New York City, has offered to supply any one who desires to compete for the prize seriously, with all the crude colemanite that the parties making the experiment may require, provided that the request for this colemanite be accompanied by a letter signed by one member of the

Board of Directors of The American Electrochemical Society, endorsing the application for the material. This condition is merely made so as to furnish the material only to those who may have the proper qualifications to experiment intelligently and with some chance of success.

Copper Production in 1907.

The smelter production of copper in the United States in 1907, according to the United States Geological Survey, was 868,996,491 lb. From the record-figures of 1906 this is a decrease of 48,809,191 lb., or 5.6%, the largest actual decrease ever recorded, and the largest relative decrease since the American copper industry became important. This is the first time since 1901 that the annual production has been smaller than that of the preceding year, and the first time since 1872 that it has been smaller than that of the second year preceding. The total given above is made up of the fine copper content of blister produced, and of the smelter output of ingot and anode copper from Michigan. Of this quantity, approximately 10,075,048 lb. in blister were produced in foreign smelters from domestic materials exported. In addition to the domestic materials handled, smelters in this country turned out as blister 64,145,648 lb. from foreign ore, concentrate, and matte. Domestic blister containing 42,350,963 lb. was exported unrefined, while blister from foreign sources, containing approximately 183,530,132 lb. fine copper, was imported for refining in this country.

The greatest decreases in smelter output are shown by the returns from three States that rank highest. Montana's production, which was 294,701,252 lb. in 1906, was but 224,263,789 lb. in 1907, and the State yielded first place to its rival, Arizona, whose production, however, showed a decrease of nearly 6,000,000 lb., from 262,566,103 lb. in 1906 to 256,778,437 lb. in 1907. Michigan still holds third place, with its production decreased from 229,695,730 lb. in 1906 to 219,131,503 lb. in 1907. Decreased production is also shown by the returns from Alaska, Oregon, Washington, and North Carolina.

Many of the other copper-producing States showed substantial gains. The output of Utah, the fourth State in point of production, was nearly 16,000,000 lb. in excess of that of 1906, the figures being 66,418,370 lb. in 1907 as against 50,329,119 lb. in the preceding year. The production of California increased from 28,153,202 lb. in 1906 to 33,696,602 lb. in 1907; that of Colorado from 7,427,353 lb. in 1906 to 13,998,496 lb. in 1907; that of New Mexico from 7,099,842 lb. in 1906 to 10,140,140 lb. in 1907; and that of Idaho from 8,578,046 lb. in 1906 to 9,707,299 lb. in 1907. Nevada and Vermont also showed productive gains.

The production in 1907 of refined new copper of domestic origin was 784,271,427 lb., a decrease of 103,410,960 lb., or 13.2%, from the production of 1906. The total output of refined copper, exclusive of domestic scrap, by domestic refineries in 1907 was 1,032,516,247 lb. In addition to this production of refined copper 25,129,617 lb. were recovered during the year by the regular copper-refining companies of the country from domestic scrap, drosses, and so forth, and returns from practically all the known refiners of secondary materials indicate that 35,355,966 lb. additional were turned out by them as casting copper, and in alloys. The copper produced from secondary sources in 1907 was therefore somewhat in excess of 60,000,000 lb., or more than 7.5% of the year's production of refined new copper.

Returns from all the Lake and electrolytic refiners are practically complete, and show the following stocks of refined copper on hand at the beginning and end of the year:

	Pounds.
January 1, 1908	125,745,796
January 1, 1907	46,497,181
Increase during 1907	79,248,615

Undelivered sales are almost entirely excluded from these figures, and stocks carried by consumers and brokers have not been estimated. In addition to these stocks of refined copper there were at the smelters, in transit to the refineries, and at the refineries, blister copper and material in process of refining to the amount of 135,310,239 lb. on January 1, 1907, and 175,254,659 lb. on January 1, 1908.

The apparent consumption of refined new copper in the United States in 1907 was about 485,000,000 lb., as compared to 685,000,000 lb. in 1906, and it is probable that in addition most or all of the 60,000,000 lb. of re-worked copper was consumed.

The figures given above are compiled from the exact records of all but one known producting company. A comprehensive report on the copper industry in 1907 is in preparation and will be published by the Geological Survey as an advance chapter from 'Mineral Resources of the United States, Calendar Year 1907.'

Instructions for Resuscitating Persons Suffering From Electric Shock.

In view of the increasing use of electricity in Mexico, G. & O. Braniff & Co., who are the general representatives in that country for the Westinghouse Electric & Manufacturing Co., of Pittsburg, Pa., are distributing among their customers large illustrated placards, upon which are printed Dr. A. H. Goelet's instructions for resuscitating persons who have suffered an electric shock. These placards are printed in Spanish and English, and are intended to be placed in generating or sub-stations, or wherever high-voltage electricity is employed. A thorough understanding of these instructions, and a careful observance of them at the time of accident may be the means of saving many lives. Recently a case occurred at a mining property in Mexico, in which a man having received a heavy charge from a 33,000-volt transmission circuit, was brought back to consciousness and ultimate recovery after more than two hours tireless application of these rules, which tends to confirm the belief that few cases of electric shock are necessarily fatal, unless the victim dies later from the effect of burns. These instruction cards G. & O. Braniff & Co. will furnish upon application, to parties in Mexico who are users of electricity.

Books Received.

THE BUILDING MECHANICS' READY REFERENCE. By H. G. Richey. 16mo., 458 pp., Ill. New York; John Wiley & Sons. 1908. Price $1.50. For sale by the MINING AND SCIENTIFIC PRESS.

The growth of cement construction is so great that an increasing number of books are issuing from the press to meet the demands for practical users. The present volume is essentially a hand-book, giving the details of everyday work; specifications and testing of cements, the proportioning of materials for concrete, the making of mortar, forms and centring, laying out work, construction of sidewalks, curbs, coping, the making of cement blocks, the use of lathing and furring, making and applying plaster, and so forth. It is brief and practical, and will be useful as a ready reference work for the man in charge of construction.

THE GEOLOGY OF COAL AND COAL MINING. By Walcot Gibson. 8vo., 341 pp. London; Edward Arnold, 1908. Price $2.50. For sale by the MINING AND SCIENTIFIC PRESS.

An excellent review in brief of the formation of coal is given in this treatise, and the discussion of fossils as zonal indices is most useful, accompanied as it is with ample illustrations. Methods of study of both exposed and concealed coalfields constitute two suggestive chapters. As for the rest, the author's outlook is too wide to be of much service in details. It shows where, and how big, and how related geologically, are the important coalfields of the world, and thus presents a review valuable as a sort of 'round-up'.

Publications Received.

'Structure of the Berea Oil Sand in the Flushing Quadrangle.' By W. T. Griswold. Bulletin No. 346 of the U. S. Geological Survey.

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EDITORIAL.

ON ANOTHER PAGE we publish a detailed description of dredging operations on the Yukon from information gathered on the spot. The article represents an earnest effort to get at the facts at first hand, and will tend to contradict some of the statements made in the columns of *The Engineering and Mining Journal*. We may state, in view of the destructive criticism which has been directed against dredging in the Yukon, and against the engineers of the Yukon Gold Company in particular, that we are frankly in sympathy with the men who are battling against natural difficulties, and who are overcoming them by technical skill. The work of the engineer must be looked at apart from the scheming of the financier, and the successes won should not be obscured by prejudice created by promoters' abuses of the facts ascertained by those in charge of solving the problems which would lead to success on a rational capitalization of the enterprise. The man who tries to conquer difficulties is progressive, at least; those who do not contribute to the solution of the problem and assert it to be insoluble are merely reactionary. It is obvious that the giving of support to optimistic schemes and the condemnation of conservative criticism is not the necessary corollary to such views as we express. Fair criticism is useful and it ought to be more welcome to a reasonable man than unintelligent compliment. We hold that the engineers of the Yukon Gold Company are of such professional standing as to be entitled to an opportunity to show what they can do, and that their work at Dawson is not to be confused with the antics of frenzied financiers at New York. We wish a complete economic success to the technical men in the North and we hope that they will not be handicapped by the exigencies of finance. Nature is on the side of the engineer who knows how to obtain her aid.

AGITATION for stringent regulations to protect operatives in and around mines has become a feature of the political campaign this year in Idaho. One party proposes to enlarge the powers of mine inspectors, giving them summary jurisdiction in criminal proceedings against mine-owners for failure to comply with requirements which these officials may impose at their pleasure. On the other hand, lack of uniformity in the requirements made by different States introduces the peril of confusion. Even in so important a matter as hoisting-signals wide variations are found. Mine regulations, like those pertaining to the railroad world, should be the same everywhere. But it is easy to over-regulate. The tendency is always to burden mining operations with petty requirements, often impossible of strict

observance, whenever a legislature undertakes to establish rules of this kind. Mine inspectors consequently are afforded opportunity for exercising a tyranny which easily becomes oppressive unless they happen to be men of large practical experience and good judgment, but men of proper calibre for wisely discharging the duties of the office are rarely available at the small salaries paid. This is a defect which seems difficult to eliminate from democratic governments. Before venturing to invest inspectors with power to inflict fines and imprisonment for failure to carry out their orders, attention should be directed toward providing salaries which will command a force of high-grade officials, removed from dependence upon political preferment, and accepted only after passing the most exacting tests in demonstration of suitable qualifications.

The Lure of Buried Treasure.

THE reason why the moralists have had to preach the virtue of patient labor so persistently is, of course, that patient labor is opposed to a strong romantic spirit in man which civilization has for ages been trying in vain to eradicate. Civilization is a leveller. It is a mechanism; it abhors the loose wheel or the unmatched gear. But the romantic spirit will break loose ever and anon, and men will indulge in a secret longing for contact with the forbidden romance of the wild old days. At least we think of the old days as being wilder and more romantic than our own, though perhaps they seemed quite hum-drum to all save the few who figured on the swash-buckling skirmish-line with or against the pirates and the outlaws. Our own peculiar forms of romance will probably appear quite interesting to those who may behold them in far perspective from the future, and the evil of them will be plainer than to us. And yet human nature will not change as much as human customs. There will always be a turning back; perhaps someone will revive the brilliant game of the endless chain of bond-issue and stock-purchase to control the traffic of a continent. So far as we are concerned, our return to a romantic past is to such crude and gross materialistic things as buried treasure, and association with survivors of piratical adventure, which shows by contrast how much more delicate and refined is the structure of modern romantic practice.

The treasure-hunter is no myth of the Sunday newspapers. The sanest plodder in commercial life is liable to be attacked with the fever. It broke out in San Francisco several years ago, when an expedition was financed to seek the Cocos Island treasure. The schooner *Herman* was purchased, equipped, and manned, and the company sailed for the South Seas under command of Captain James Brown, alias Brawn, said to be a self-confessed buccaneer, who helped capture treasure-ships bound from Australia to England in the days when the Indian ocean was not as safe as it is today. The expedition was one of continuous excitement and ultimate disaster. The instincts of the pirate—bluster, suspicion, cowardice, treachery, cruelty—all came out in strong relief. The story was told by one of the treasure-hunters in a book entitled, 'Our Search for the Missing Millions,' published in 1904. It would hardly be worth recalling, except as a reminder of a lost opportunity for some melodramatic playwright to win reputation, were it not that the irrepressible Brown has stirred the enthusiasm of some calculating New Englanders who have organized a company under the laws of Massachusetts for a second effort to obtain the long-lost treasure. At the same time a rival party is in the field. The Messrs. Robinson of Streatham, England, in company with Lord Fitz Williams, have obtained a concession to Cocos island from the Costa Rican Government, to search for buried treasure, coupled with a saving privilege to explore for minerals. Myth and conflicting tradition alternately favor the opposite theories on which the two expeditions have been undertaken. Captain Brown avers that he helped remove the stuff from its ancient resting place to an uncharted island in the vicinity of Samoa. Part of the treasure being kept for immediate use led to a series of unmentionable barbarities which left Captain Brown in possession. Others affirm that the treasure was never taken away.

The story has some foundation in fact. When the royalist adherents in Peru had taken final refuge in Callao from the revolutionists, in 1820, they are reported to have despatched a vessel with treasure and other valuables for friendly shores. The crew mutinied, and buried the coin, plate, and jewels on Cocos island, which is a solitary peak rising 2800 feet out the ocean about five hundred miles west of Panama. While the story up to this point may be true, it is evident that too many knew the secret, and that the treasure has long ago passed into general circulation. Meanwhile Captain Brown has given refreshing proof that the blood of New England is not so frozen but that it may still respond to the thrill of the romantic tales of jolly buccaneers.

Fee-Simple Tenure of Mining Property.

THE question is raised by a correspondent, whose letter we publish in this issue, whether demonstrable superiority over the leasehold system inheres in the American law which grants absolute title to mining land. This leads to something more than a mere academic discussion. The creation of National Forest Reserves, as part of a broad policy for the preservation of natural resources, has re-opened questions supposedly stilled forever in statutes and decisions which had apparently crystallized certain principles into our organic law. The re-appearance of the Government as landlord would not have been seriously mentioned a few years ago. Changing needs, however, dissipate reverence for conservative restraints, and when the mining law refuses to harmonize with forest regulations, and subjects the plain intent of the forests to peril, the essential desirability of fee-simple ownership may require further defense. The superiority of that principle has not been taken for granted, and there exist many advocates of a different basis of right applicable to mining claims on forest reserves. Nevertheless, we

do believe the individualistic spirit in America to be so strong that there will occur no turning back from the ascending course of development which has marked the growth of our institutions. We affirm this in spite of recent tendencies toward centralization which have won applause for the administration of President Roosevelt.

A leading characteristic of the political evolution of the United States has been an accentuation of the rights of the individual, accompanied with elimination of those forms of governmental scrutiny and control which have always proved oppressive. The nearer government approaches the functions of a protector of private rights under laws that give no unequal opportunity, the more perfect it is. The phenomenal growth of this country has been due in large part to the exaltation of the rights and privileges of the individual, and among these the extension of the principle of ownership in fee-simple has been more thorough than in any other country in the world.

Our correspondent questions whether necessary advantage lies in such tenure of real estate. He limited the case to mining claims, but we put it thus broadly, for if it is not essential to the best development of the mining industry the argument for a leasehold system would apply with equal force to any real property whatsoever. The fact that five-sixths of the mining areas in the world are administered under the concession-principle indicates at once that the United States occupies a position in this matter apart from the customs of other nations. This means, then, that with the exception of copper the majority of the metallic wealth of the world is produced under a mine-tenure which is not secured by absolute indefeasible title. Evidently capital has not been sensitive to the possibility of forfeiture involved in such a system, hence it is most reasonable to inquire wherein lies the superiority of one system over the other? In the Transvaal, which led the world's production of gold with $10,676,000 in 1907, the State retains the ownership of minerals, and exacts both ground-rent and a tax on the net output of the mines; but the country is not entirely open to the public. Several exclusive concessions covering large territories are in existence. Monopolistic privilege is one of the evils which readily creeps in under the principle of government ownership. This has also limited the advancement of several districts in Canada. Otherwise the Dominion is as open and fair as it can be under the concession-system, which in effect colors nearly all legislation concerning mines, despite a limited granting of fee-simple titles to certain mineral lands in a few of the Provinces. The abuses at Cobalt, stimulated by the greed suddenly developed in the face of possible extraordinary revenue, is a case in point. Where the principle of the concession, or the leasehold, prevails, instead of the fixed conception of the government as only a trustee for the public with regard to unimproved lands, to hold them until demanded in fee-simple by individuals, one can never tell what freaks in contravention of the liberty of the people may be displayed by the lawmakers. Liberty to develop and utilize the natural resources of a country without fear of having the fruit of one's labor destroyed by withdrawal of lands from acquisition in the normal way as soon as they may be shown to possess value, even though such withdrawal be temporary, is an evil which can arise only where the ruling political theory is grounded in a past that had not risen to the highest conception of the rights of the individual.

In Egypt the granting of immense concessions has been the chief feature of the Government's effort to develop the mineral industry. The governmental restrictions extend even to the transfer of mining property, requiring the consent of the Minister of Finance after presentation to him of the details of the transaction. The concession-system also prevails in India, where heavy royalties, amounting to 7½ per cent on the net profits, are collected from producers of gold and silver. Payment of heavy royalty is also exacted in the Malay Peninsula, accompanied with the requirement of continuous work. In Australia the system is that of short-term leaseholds, renewable to previous tenants, with the tenure dependent wholly on the punctual payment of the rent, and the continuous employment of a certain number of men underground. In Spain concessions are in perpetuity, subject to payment of annual imposts, failure to pay which causes forfeiture within fifteen days. Another inconvenience of the concession-theory, found in Spain, and to some extent appearing in many countries subject to these ancient customs, is that more than one concessionaire may have contemporaneous rights in different minerals on the same piece of ground.

The cases given reveal only a few of the difficulties proceeding from this system. They are difficulties derived from the false notions concerning individualistic rights on which the feudal system was founded. The penalties attached to non-payment of taxes are not comparable to the swift and irrevocable forfeiture which follows failure to pay rent or royalty. Fee-simple ownership accords rights which strike deep root into the soil. The severance of such an owner from his estate is not easy. Though he may have failed in all his obligations and have long abandoned the land, the title of a later claimant is clouded by that old possessory right until wiped out by a decision of a competent court. Not so with the leasehold. Failure to pay erases the claimant as if he had never been, and the next man who steps on the ground, and complies with the regulations, is master. Here, at bottom, rests the great difference which gives such paramount advantage in point of security to a title in fee-simple. It is a title that protects the man, whereas under the concession-system the man must protect the title. We have a perfect example of the great contrast between the stability of possession under the two systems in the tenure of a mining claim before and after issuance of title in the United States. The least irregularity opens the way for the 'claim-jumper' until the parchment comes from Washington with the great seal. Then the claim-pirates must needs seek other and easier galleons to loot and scuttle.

Personal.

J. B. Fleming is in San Francisco.

Howard D. Smith is in Amador county, California.

Elwyn W. Stebbins is in Calaveras county, California.

J. T. Logan, of Waldo, Oregon, was in San Francisco last week.

J. M. Callow has returned to Salt Lake from a trip to Alaska.

Arthur W. Stevens has moved from Boise, Idaho, to Los Angeles.

L. D. Carter, of Oakland, California, has returned from New York.

H. Foster Bain, of Urbana, Illinois, was in San Francisco this week.

John B. Farish was in San Francisco last week and has gone to New York.

W. J. Mitchell has returned to Santa Eulalia, Mexico, from a visit to California.

H. V. Winchell is at Wallace, Idaho. He will return to Minneapolis on September 1.

R. H. Toll, of Denver, is making an inspection of the Montezuma district, Colorado.

E. J. Moore, Colorado manager for the Mining and Scientific Press, is in San Francisco.

J. E. Spurr has been making an examination of the Camp Bird mine, in Ouray county, Colorado.

W. L. Cobb, of San Francisco, is at Atlanta, Idaho, where he will be on examination work for several weeks.

G. W. Winter is ore-buyer for the United States Mining & Smelting Co., being stationed at Butte, Montana.

F. S. Shewell has been appointed manager for the Arizona Gold & Copper Hill Mining Co., Phoenix, Arizona.

J. V. N. Dorr has returned to the Black Hills from a two weeks' visit to the Nelson, B. C., district on professional business.

H. A. Guess has been appointed manager for the Federal Lead Co., Flat River, Mo., which appointment will take effect October 15.

H. S. Washington, of New York, has sailed for South America, where he will spend several months in the gold-mining districts of Brazil.

Lucian Eaves, of Los Angeles, has gone to Mexico for an extended examination of the San Miguel group of mines, at San Miguel del Mezquital, Zacatecas.

H. F. Lefevre has recently returned to Reno, Nevada, from a trip through Arizona, Mexico, Guatemala, and Salvador. He is now on an inspection trip to central Nevada.

Edward L. Dufourcq has returned to New York, after an absence of several weeks at Mexico City. While there he underwent an operation for appendicitis, which was entirely successful.

Catalogues Received.

The Ernst Wiener Co., of New York, has recently issued an attractive folder calling attention to some of its specialties.

The Cleveland Pneumatic Tool Co., Cleveland, Ohio, has recently issued Bulletin No. 40, describing the No. 40 'Cleveland' stope-drill.

The Vulcan Iron Works, of San Francisco, has recently issued a new catalogue giving full information regarding ice making and ice-making plants.

The Power & Mining Machinery Co., Cudahy, Wis., has recently issued Bulletins No. 27 and 28, describing respectively Huntington mills and crushing rolls.

The Joshua Hendy Iron Works, San Francisco, has recently issued Bulletin No. 111, on gravel elevators and water-lifters. The pamphlet is handsomely printed and illustrated and gives much valuable information, aside from the descriptions of apparatus.

Latest Market Reports.

LOCAL METAL PRICES—August 27.

Antimony	12@16c	Quicksilver (flask)	$40@42.50
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.95@ 5.90c	Tin	32@33½c

ANGLO-AMERICAN SHARES.
Cabled from London.

	Aug 20. £. s. d.	Aug. 27. £. s. d.
Camp Bird	0 14 9	0 14 3
El Oro	1 8 0	1 7 0
Esperanza	3 5 0	3 12 6
Dolores	1 10 0	1 10 0
Oroville Dredging	0 8 6	0 9 6
Stratton's Independence	0 1 0	0 1 0
Tomboy	1 2 6	1 3 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Aug. 21	13.44	4.59	4.68	51½
" 22	13.44	4.59	4.68	51¾
" 23	Sunday.	No market.		
" 24	13.44	4.59	4.68	51½
" 25	13.44	4.59	4.68	51¼
" 26	13.44	4.59	4.68	51¼
" 27	13.44	4.59	4.68	51½

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Aug. 20.	Aug. 27.
Amalgamated Copper	77½	79⅞
American Smelting & Refining Co.	94¾	97¾
Boston Copper	12¾	13
Butte Coalition	26¾	26¾
Cumberland Ely	8¼	8½
Dolores	6¾	6⅞
El Rayo	2½	2¾
Giroux	4⅜	4¼
Greene-Cananea	11½	11⅜
Indiana Sonora	5⅛	5⅛
La Rose	5 9/16	5¾
Miami Copper	9¾	10⅞
Nevada Consolidated	15⅛	16⅝
Newhouse	6	6⅛
Nipissing	9	8⅞
Ohio Copper	3	3⅜
Tennessee Copper	37¼	37¼
Utah Copper	44¼	44
Yukon	4⅞	4⅝

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, August 27.

Atlanta	$ 30	Laguna	$ 1.20
Belmont	1.15	Manhattan Con	9
Booth	47	MacNamara	60
Columbia Mtn	28	Midway	43
Combination Fraction	1.57½	Montana Tonopah	1.45
Daisy	75	Nevada Hills	1.60
Fairview Eagle	40	Rawhide Queen	74
Florence	3.65	Sandstorm	30
Gold Bar (Bullfrog)	4	Silver Pick	20
Goldfield Con	6.62½	St. Ives	30
Gold Kewanas	45	Tonopah Extension	75
Great Bend	36	Tonopah of Nevada	7.50
Jim Butler	30	Tramp Con	17
Jumbo Extension	46	West End	65

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.
Wires out of order on August 27.

	Closing prices. August 26.		Closing prices. August 26.
Adventure	9½	Michigan	13
Ahmeek	80	Mohawk	64¾
Allouez	36½	Nevada Con	16¼
Amalgamated	78¼	North Butte	83¾
Arcadian	——	Old Dominion	29¼
Atlantic	14	Osceola	109¼
Bingham Con	60	Parrot	26½
Boston Con	12⅜	Phœnix	50
Butte Coalition	26¼	Quincy	93
Calumet & Arizona	117½	Rhode Island	4
Calumet & Hecla	670	Santa Fe	1¾
Centennial	33½	Shannon	14⅞
Con. Mercur	42	Superior & Pittsburg	13
Daly-West	9⅝	Tamarack	72
Franklin	12	Trinity	18½
Granby	102	United Copper Con	11½
Greene-Cananea, ctf	11	Victoria	5¼
Isle Royale	23¼	Winona	6½
Mass	7	Wolverine	143

THE CALIFORNIA DEBRIS COMMISSION, having received applications to mine by hydraulic process from Berkeley Placer Mining Co. in Berkeley Placer Mine, near Lowell Hill, Nevada county, California., draining into Steep Hollow creek, and from Cleveland Gold Mining Co. in Cleveland Mine, near Scales, Sierra county, California, draining into Rock creek, gives notice that a meeting to receive any protests will be held at No. 1733 Pine St., San Francisco, California, September 15, 1908, at 1:30 p. m.

General Mining News.

ARIZONA.

GILA COUNTY.

A small force was put to work on the Keystone property last week, making roads and trails to facilitate the moving of machinery and supplies and grading sites for drilling rigs. It is proposed to prospect the ground by sinking a series of holes 600 ft. deep, about 200 ft. apart, with churn-drills.

MOHAVE COUNTY.

The Golden Gem mill, at Cerbat, was started up a few days ago on a 75-ton sample of ore from the Red Seal mine, which was acquired by the Company two years ago. Should this sample lot give good results it is the intention of the Company to work the mill on a large scale. At the Gem mine the Company is unwatering below the 300-ft. level and expects to be ready to commence sinking by next week. Everything above the 300-ft. level has been put in first-class shape.——A discovery of four feet of $102 gold ore on the sixth level of the McCracken mine, at Kingman, has caused considerable excitement because that property has always produced only silver-lead ore in the past. A reduction plant is one of the future improvements planned by this concern. ——The old board of directors of the Redemption Copper Co., at Chloride, has been re-elected. A hoist has recently been installed and work on the mill is progressing rapidly.

SANTA CRUZ COUNTY.

An arastra is being built on claims near Patagonia owned by C. B. Wilson, J. W. Morris, and A. E. Moody. The ore to be treated is a black cinder easily ground to powder, and carries considerable fine gold. The vein is two feet wide at the surface, but at the bottom of a 35-ft. shaft has a width of five feet. On another claim there is a two-foot vein of quartz which assays $20 gold, with some silver.

YAVAPAI COUNTY.

(Special Correspondence).—The Mildred Gold Mining Co. has recently installed a new steam hoist at its shaft on Rich hill, in the Weaver district, and will push developments. This property has been worked since 1865, and no small amount of ore has been shipped by Dan Genung and his father, from whom the present owners purchased the property.——John R. McDonald has uncovered an 18-in. vein in the Slate Creek country, between the Jersey Lily and the Blue Dick mines, which assays $25 per ton gold and 2% copper. A shaft will be sunk.

Phoenix, August 24.

The 10-stamp mill of the Elliott Con. Mines Co., at Chaparral, is running steadily, and regular shipments of bullion and concentrate are being made. The present rate of concentrate shipment is two cars per month. Sinking will soon be resumed in the 400-ft. shaft, and a 10-drill air-compressor will be installed. It is the intention next fall to replace the present 10-stamp mill with one of 40 stamps weighing 1000 lb. each.——The Green Mountain group of mines, in Copper Creek district, 10 miles south of Prescott, has been sold to a syndicate composed mainly of New York men. The property has a shaft 230 ft. deep, and several hundred feet of drifts, in one of which is a large body of copper.

CALIFORNIA.

AMADOR COUNTY.

The South Eureka has commenced the erection of a cable tramway from the mine to the Central Eureka mill. The South Eureka has more ore than can be handled at its own 20-stamp mill, so it is proposed to use 20 stamps of the Central Eureka until that mine has reached a stage of development requiring its full milling capacity.

BUTTE COUNTY.

The city of Oroville has enjoined the Indiana Gold Dredging Co. from enlarging or continuing the pile of tailing at its dredge on Feather river. It is claimed by the city that the dredging company has reduced the width of the channel over two-thirds, and thereby endangered the property of the city and of its inhabitants. As the result the dredge has stopped work.

ELDORADO COUNTY.

A company of Los Angeles men has purchased the Joe Delwisch and the Jimmy Breedlove mines, on Otter Creek hill, about four miles north of Georgetown, from L. H. Fowler, of Roseville. W. H. Hartvig is at the property in the interests of the new owners, and will start development work at once.

NEVADA COUNTY.

(Special Correspondence).—The rich orebody opened up in the 200 and 300-ft. levels at the Kenosha has been intersected by a drift on the 400-ft. level. The pay-shoot has widened to 12 in. and assays run from $100 upward. The shaft is down below 400 ft. and is being sunk steadily. More men will be added to the force within a short time. ——A company of local people have bonded the old Hill mine, in the heart of Grass Valley, and will thoroughly explore the property. When last operated a good vein of milling ore was opened up.——The company which recently took a bond on the Normandie is rapidly completing arrangements for the working of the mine on a large scale. ——The Graystone mine, in the northern part of the county, has been purchased by J. S. McKaig, of Pittsburg, and Johnston Slinghuff, of Baltimore. The shaft will be sunk to greater depth and considerable development work carried on. George Heggarty is superintendent. The same men have taken a bond on the Snow Point mine and propose to work it extensively.——Two new transformers are being placed at the Alaska mine, to replace those recently destroyed by fire. Operations at the mine will be resumed within a week.——Samuel Colt has arrived to take charge of the Lecompton and Oustomah mines. The former is being rapidly unwatered, and experts are sampling the Oustomah ore.——A. M. Gilbert, of Santa Barbara, has bonded the Dillion, Dower, and Boston properties, in the Graniteville district. Active work is planned.——Owing to the shortage of water, only five stamps are running at the Yuba mine.——The same company is working one shift at the Grey Eagle mine.——The report that the Eagle Bird mine has been re-opened is erroneous.

Grass Valley, August 24.

SHASTA COUNTY.

The Greenhorn copper mine, in the French Gulch mining district, has again been bonded by the Bully Hill Copper M. & S. Co. This Company did about $10,000 worth of development work on the mine, commencing in the fall of 1905 and ceasing about the time of the panic last year. J. W. Heath, employed at the Mammoth mine, is one of the owners of the Greenhorn property.

SIERRA COUNTY.

One of the big transformers at the Alaska mine has again burned out, and things will be at a standstill for ten days, until it is replaced.——F. P. Reddy has now 11 men at work on the Reese ravine property. Andy Johnson, of Deadwood, and Scott Bros., of Poker Flat, have taken a contract to whip-saw 10,000 ft. of lumber, which will be used in building the mill, boarding-house, and other buildings.——The contractors on the lower adit of the Tightner, at Alleghany, threw up their contract last week on account of the hard rock, claiming that they were hardly coming out even. Two shifts were, however, put to work Monday morning by H. L. Johnson, and the work will be completed by day's pay. ——L. R. Fulcher is making an examination of the Lassiat mine, in the interests of DeGolia & Atkins, of San Francisco, who have a bond on the property.

SISKIYOU COUNTY.

C. P. Elmore, who owns two groups of claims on the west fork of Big Humbug, recently leased a part of his holdings to Kiernan Bros., of Yreka. A twin-tub arastra is being built near the property, in which will be treated the ores from both the Kiernan lease and Mr. Elmore's operations.——A cinnabar prospect of some promise is owned

by A. M. Cowgill on the west fork of Beaver creek, near the Garretson cinnabar springs. The property comprises three claims, which cover a mineral-bearing dike in the micacious schist. The dike is composed of a network of seams, gashes, and fissures, which all carry the quicksilver-bearing ores, that occur largely as a sulphide or crystalline cinnabar, more or less pure, or finely disseminated throughout with a fine-grained sugary quartz. The ground is crossed by a ditch, the water from which Mr. Cowgill is using in an effort to cross-cut the dike and sluice away the surface soil, to enable him to follow any one of the numerous seams to some source or point of origin.

TRINITY COUNTY.

A strike of rich ore was made in the Brown Bear mine, near Deadwood, last week by A. E. Paulsen and associates. The property has been idle for some time, and the owners had been working only a short time when the find was made. It is said the vein is four feet wide, and that samples assay as high as $500, while the whole width will average $100.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The bond of $10,000 upon the Ramsdell group of six claims, on Lincoln Mtn., was paid this week. The Ramsdell G. M. & M. Co. has been reorganized and it is understood that funds have been provided for extensive development. The Market adit is to be advanced to the intersection with the Golden Jack vein, which lies about 50 ft. ahead. The milling plant is to be completed and equipped with the latest improved machinery. M. Jacoby, of Georgetown, is acting as resident manager.——The Lincoln adit is now in 900 ft. and within 60 days it is hoped to reach the Virginia City shaft workings at the 500-ft. level.——Palmer & Co. have taken a lease at the Sidney adit and sinking has been started on the blind vein cut 2125 ft. from the entrance. A streak of high-grade silver-lead ore is being followed that is from 6 to 18 in. wide. These lessees control a block of ground 200 ft. deep by 100 ft. long.——M. J. Riley, owning a group of 21 claims on Democrat Mtn., is making ready to start extensive development. During the past week a number of Denver capitalists have been in camp, and it has been decided to start an adit. This property is on the western side of the hill and is surrounded by such well-known producers as the Sunburst, Astor, and Polar Star.——A. Robert, owner of the Sunburst Extension, has resumed work. The cross-cut is being driven forward and another vein will be reached within 25 ft. In the Sunburst Extension vein, which was passed some weeks ago, a streak of high-grade ore is showing that is from 4 to 6 in. wide, but owing to the shallow depth secured, no driving has been done.——W. T. Bushman, of Buffalo, N. Y., has been in camp during the past ten days. Mr. Bushman has been appointed trustee for the holdings of the Magnet M. & M. Co., operating through the Doric adit. A company is now in the course of organization to be known as the Buffalo M. & T. Co., and Mr. Bushman states that ample funds will be forthcoming for future operations. A force of 14 men in two shifts is now employed, but more will be put on in a short time. Operations are being centred in stoping on the Magnet vein, cut 2400 ft. from the entrance of the adit. A streak of smelting ore is exposed for 150 ft. which is from 1 to 4 ft. wide, the value of which varies from $40 to $173 per ton in gold, silver, lead, and copper. From what can be learned of the plans of the new Company, the adit is to be advanced for several hundred feet.——Riley & Co., leasing on the Grant level of the Sunburst, will start shipments of high-grade ore the coming week. For some time past work has been under way in the driving of the west drift, the ground having been opened for 50 ft. From the last shipment returns of 420 oz. in silver per ton were received.——Good headway is being made in the advance of the Burns-Moore adit on Chicago creek. In the raise being carried on the Black Lion vein the streak of ore is gaining in size, now being 10 in. wide. Driving is to be started to the eastward for the proving of the extent of the discovery.——Heavy shipments of ore are being made from the Pittsburg Con. M. & M. Co. holdings. This property will eventually be operated through the McClelland adit, a contract to that effect having been entered into some months ago. The adit is now nearing the Pittsburg vein, and as soon as the objective is reached driving will be started.——The aerial tramway running from the sixth level of the Mineral Chief mine is now delivering ore to the Linn Con. Co. mill. The machinery is doing excellent work and shipments of concentrate have been started.

Georgetown, August 22.

LAKE COUNTY.

Recently Pugil, Kus, and associates obtained a lease on a portion of the Alps consolidation of claims in South Evans, and they have placed a hoist on what is known as the Shinn or Ward shaft on the Columbus claim. The shaft was sunk eleven or twelve years ago to a depth of more than 100 ft. without penetrating the lime. A streak of ore was found and some shipments made from it. The ore was a heavy galena with some gold and silver.——The Dempsey tunnel, near the London, has been leased to Denver parties represented by F. J. McNair, and men and supplies are now on the ground to push the work vigorously and systematically.——At a depth of 70 ft. a streak of tellurium has been opened in the Margaret mine, near Granite. This contains a heavy deposit of gold. Shipments have been started to the Leadville smelter.——It is likely that arrangements will soon be made for the extensive operation of the old Kankakee property, in the Big English gulch. During the past year some high-grade ore was taken from this property, but it has been worked only in a small way. There is a long adit on the Kankakee, through which the country is drained.——It is thought that the Ibex No. 4 shaft, which has been closed since the first of the month for repairs, will be ready for operations before September 1. The re-timbering of the shaft is progressing rapidly, and the other improvements which were planned will take less time to complete than was figured on.

SAN JUAN COUNTY.

The Danville Leasing Co., composed of people from Danville, Ill., has been incorporated to work a lease on the Shenandoah property through the Trilby adit. The Company has been at work some time and has started drifts both ways, and has found some very good silver ore.——George Hider, of Hotchkiss, has been put in charge of the Newport property, on Engineer Mtn., and now has a force of eight men doing development work.——It is believed that the recent tests which the Contention mill made on the Champion are were entirely satisfactory, and that the Ross Co. will build a mill at once. T. C. Woodworth, who had charge of the tests, has gone to Pittsburg to confer with the officers of the Company, and it is stated he will return to Silverton early in September and start actual construction.——The recently organized Iowa-Tiger Leasing Co. has started a small force of men cleaning up the tramway and will begin mining operations as soon as supplies can be taken to the property.

SUMMIT COUNTY.

In the eastern end of the county, between the north and middle forks of Swan river, a new mining camp, called Goldsboro, has been established. The chief operators are building a mill.——The Snyder placer, on the Swan, near Breckenridge, resumed operations last week under a temporary agreement with the Colorado Gold Dredging Co., pending the settlement by the courts of the injunction secured by the latter. The agreement holds for four years.

TELLER COUNTY.

The C. B. Wheeler G. M. & L. Co. is to be incorporated to work the Alhambra property, on the west slope of Squaw Mtn., near Cripple Creek. One of the members of the Company claims to have found a shoot eight years ago which assayed as high as $30,000 per ton, and it is this vein which the new Company will explore.——The Roosevelt deep

drainage tunnel is now in a little over 3000 ft., and satisfactory progress is still being made.——The Birdsell Leasing Co., operating the properties of the old Rittenhouse G. M. Co., the White Elephant, Happy Day, and Fraction No. 1, on Gold hill, made its initial shipment last week. The leasing company is breaking ore on three levels, the second, fourth, and sixth, from a vein from four to six feet wide, and is using machine-drills. The ore is of milling grade, and is estimated to be worth from $10 to $15.——E. F. Woods and associates have taken over the lease on the Maloney shaft of the Isabella Mines Co., formerly held by Wilson Bros. A shipment will soon be made.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The Amador mine, near the Montana-Idaho divide, concerning which there has been so much scandal, is to be re-opened and a company formed to merge the interests of the Amador Gold & Copper M. & M. Co., the Amador Railroad Co., and the Amador Smelting Co. into one concern, with a single set of officers. The reports to the effect that this property was worthless did perhaps more harm to the district than anything else within recent times. Wilbur Gruss, treasurer for the re-organized Company, has been in the district for several days past, and has secured the co-operation of practically all the local stockholders. A syndicate of these had already engaged John H. Nordquist, a mining engineer of this district, to make an examination of the property. His report was entirely satisfactory, and embodied an offer to lease the mine himself and repair the railroad at his own cost, involving a sum of not less than $3000. It is calculated that there is enough ore in sight to run the smelter for at least six months. Every effort is being made to pay off the Company's indebtedness of about $50,000, and local holders have been led to believe that the mine will be on a full shipping basis within the next twelve months. The personnel of the new management has not yet been made public.——A syndicate of Wallace business men, headed by Forest D. Fraser, has taken a two years' lease of the property of the Josephine Copper Mining Co., near Stark, Mont., together with an option to purchase within two years from August 10. The lease stipulates that a force of men shall be kept continuously at work on the property during all the life of the lease, and the Company is to receive 10% of all smelter returns on the ore shipped. Already several large bodies of ore have been opened up and a considerable amount shipped. Development work has been carried on for more than thirty years.——A strike of 3 ft. of rich carbonate ore has been made on the property of the Coeur d'Alene Vulcan Mining Co., about two and a half miles west of Wallace, and adjoining the old Argentine mine. The ore carries some gray copper and native silver, assaying from 50 to 150 oz. silver per ton.——The Amy property, on Pine creek, near Wardner, which has been held under bond by J. L. Safford, has been bonded by Mr. Safford to J. H. Kinsley of Spokane for an amount said to be in the neighborhood of $200,000. The group consists of eight claims between the Corrigan and Wonder mines. Almost 2000 ft. of development work has been done and some excellent ore exposed.——A car of ore is about to be shipped from the property of the Swastika company, on Four Mile gulch. The vein on this property has been exposed for a distance of 250 ft., showing ore which assays all the way from 4 to 20% copper and carrying a pay-streak about 15 in. wide. It is ore from this streak which will be shipped.——An assessment of five mills per share has been levied on the stock of the Alameda Mining Co., payable September 20 and delinquent 30 days after that date. The money raised will be used to carry on work at the property.——The recent strike on the property of the Great Western Mining Co., near Burke, has now widened out to about 24 ft. of good milling ore, at a depth from the surface of about 75 ft. Another adit is being driven to tap the vein farther to the east. T. H. Scott, the manager, has purchased a hoist with a capacity of 500 ft., and as soon as this has been installed a shaft will be sunk at a point near the approximate centre of the ore-shoot. During the progress of sinking, Mr. Scott will continue driving eastward to determine the length of the ore-shoot.

Wallace, August 22.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—The Wyandotte land southwest of Galena has been opened to operations at a reduced royalty, and as a consequence a number of new leases have been taken. The ore is found from 55 to 108 ft. Only the western portion of the ground has been prospected, but the Company states that there is enough ore in sight to supply the mill for several years.——The Rockenham land, adjoining the above tract, is being drained by Dillon, Ramsay & Co.——Twenty acres north of Galena, developed by Ping & Robertson, have been leased by New York capitalists. Four drill-holes on the leases developed ore at 225 ft., and also at 299 ft. A 250-ton mill will be erected on each ten-acre tract, and a shaft begun by September 1.——An old shaft discovered under tailing and debris on the old Delta Mining land in the southwestern part of Galena has caused considerable interest. The shaft is very small, about 3 by 3 ft., and is a relic of the early mining days. Ore was bought from this shaft more than 25 years ago. John Franklin and associates own the lease and are installing machinery with which to operate through the old shaft.——The Herald Mining Co. has been closed down for several weeks while work has been rushed in sinking the incline shaft to a greater depth. The shaft will be sunk entirely through the orebody, which will then have a 76-ft. face. The vertical shaft will later be connected to the incline. During the sinking of the shaft a large orebody was struck which gave good assays in lead. When the development work is completed the mill will be started.——A 200-ton mill is to be built on the Maland & Maston ground, at Peacock. Extensive drilling has shown the existence of a rich zinc-blende orebody from 174 to 188 ft.——Three new mills are being erected in the vicinity of Baxter Springs. Wiggington & Milton are pushing the erection of the Lucile mill. The Good Luck will have a plant running by September 1, and a 150-ton mill is being built on the Chicago-Quapaw lease.

Galena, August 22.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The greatest innovation in the district is the starting of a steam-shovel in the American Z. L. & S. Co.'s No. 2 shaft, as Prosperity. The machine has been in operation about five weeks and although in the experimental stage it seems to be working satisfactorily.——The McConey, the oldest mill in the Webb City district, built more than 25 years ago, has been put in operation again.——The old Monticello lease, at Prosperity, has taken on new life under the management of the new Chicago-Joplin Co. The mine was unsuccessful under former management and it was thought that the orebody was exhausted. With renewed operations by the present management an exceedingly rich orebody was discovered and the Company is now working an 8-ft. stope in which there is a large percentage of lead. The weekly output of the mine is now from 24 to 40 tons of zinc-blende and 10,000 to 15,000 lb. of galena. The rich ore was found below the old drifts.——The Over Yonder Mining Co. has been organized to take over the old Glass lease, north of Webb City. The mine is already well developed with numerous drifts. Operations have been started by the new Company.——Many prospectors are seeking shallow lead deposits on the land of the Center Creek Mining Co., encouraged by the lower royalty required by the land owners. The royalty has been reduced from 25% on zinc-blende and 40 to 50% on galena to 20% on both ores. Galena is often found at 20 ft. and a number of good strikes have been reported. The custom mill, which was burned last spring, has been re-built and is now

being operated by H. C. Gaston.——There is a great amount of activity in the mining region south of Joplin. At Spring City, the Argosy Mining Co. has undertaken a greater amount of development work. Two drifts have been run out from the shaft at 112 ft. toward two drill-holes 85 ft. away and the drifts penetrated rich ore so that the small mill is being taxed to care for the product.——The Company is preparing to remodel the mill, installing new machinery and increasing the capacity. A drill is at work prospecting the ground west of the mill, near the Sunrise mine.——The Hallowe'en Mining Co. is developing a ten-acre lease in the same camp. A shaft is now down 80 ft., where the drill showed the same lead deposit as was found in the Delta mine.——One of the best silicate deposits of some time has been opened up in the De-Masters mine, on the Olson land in Newton county. The Company produced over 40 tons of concentrate last week and is hoisting from 8 to 10 tons per shift. A milling plant has recently been completed.——Acid-proof pumping machinery is being installed to drain the J. A. Potter mine, south of Joplin. Operations will then be resumed upon this ground which has been a good producer. The ore-body runs from 10 to 12% concentrate.——Centrifugal pumps have been installed in the Belleville district and are proving very successful in draining the ground. Two good drill strikes have recently been made there by Budd Robinson while prospecting two strips of ground aggregating 650 acres. The ore is found from 110 to 140 ft. and seems to be in an old water channel. The same formation was found in the Midnight mine, where the walls of an old water course were rich in ore.——The Diamond Jack mine, at Chitwood, is again under operation and two good ore faces are being worked. The 150-ton mill has been idle about three weeks, but a large force of men has now been put to work. The ore is being worked at 160 ft. and the deeper deposits will be developed later.

Joplin, August 22.

MONTANA.

LEWIS AND CLARK COUNTY.

(Special Correspondence).—The Spring Hill mine is situated four miles south of Helena, in Orofino gulch. The holdings of the Spring Hill Co. adjoin the Whitlatch group, the latter being on the opposite slope of the ridge that separates Orofino from Grizzly gulch. The Whitlatch has not been operated during the past year, and its air-compressor, 20-stamp mill, and cyanide plant have been leased to the Spring Hill M. Co. To make use of the air-compressor a pipe-line was laid from the compressor-plant to the Spring Hill mine. The ore is hauled from the mine to the Whitlatch mill over a surface tramway, built in four sections. The first consists of a mile of level trackage; the second is an incline 600 ft. long, by which the cars of ore make an ascent of some 200 ft. to the top of the ridge, where they are discharged into bins; the third section consists of surface trackage from the bins to the crushing plant near the Whitlatch shaft; the fourth section is an incline, over which the crushed ore is conveyed to the stamp-mill in side-dump cars.. The ore-zone of the Spring Hill is in granite, near the contact of the latter with limestone. It is opened by an adit which was driven 750 ft. along the lime-wall by former operators, who were following a vein of pyrrhotite which was partly in the lime. In this work the object was solely to extract the pyrrhotite, required as a flux for a Butte smelter. When, within the last two years, the Spring Hill company, under the management of F. L. Sizer, got control of the property, cross-cuts were driven at regular intervals from the old adit into the granite. These cross-cuts were driven from 50 to 100 ft. from the lime-contact, demonstrating the existence of a mineralized zone on the granite side of the contact, ranging from 40 to 80 ft. wide. The gangue material is a silicified granite, carrying gold in the free state, and associated with iron pyrite. This zone strikes east and west, the north boundary being the lime-contact; on the south side there appears to be no wall or definite boundary, as the mineralization gradually fades out into the granite. By extending drifts from one cross-cut to another, great bodies of ore are blocked out. A 100-ft. winze has been sunk from the main adit-level on the ore, and extensive driving and cross-cutting have been done from the station at the base of the winze. An air-hoist operates a cage in this winze. The Company has 1½ miles on the strike of this zone. The mill, which is operated by electric power, crushes to 30-mesh and handles about three tons to the stamp per 24 hours. The larger part of the gold is recovered on the plates, the pyrites are taken up by Wilfley tables, and the tailing is passed through launders to the cyanide plant, where the sand and slime are parted by spitzkasten and Callow classifiers. The slime is cyanided in agitating-tanks, and the sand in the regular leaching-vats, having Butters distributors for filling them. The precipitating is effected in zinc-boxes of the usual type. Mr. Sizer speaks of the possibility of the Spring Hill Co. erecting a mill at the mine capable of milling from 350 to 500 tons per day.

Helena, August 22.

NEVADA.

ESMERALDA COUNTY.

The Hazel Goldfield Mining Co. has let a contract to J. M. Beach for additional depth in the Company's shaft on the Last Chance claim of the Laguna estate of the Goldfield Con. Mines Co., namely from the 550 to the 650-ft. point. Mr. Beach has also been given a contract for lateral work on the 450-ft. level, where a promising stringer was found while sinking the shaft.——The Goldfield American has resumed work. The shaft has been unwatered and cross-cutting has been started in two directions at the 200-ft. level.——The Mohawk Ledge Co., which is operating a lease on the Wedge claim of the Consolidated, formerly the Jumbo Extension, has let a contract to sink the shaft 200 ft. deeper. The lease has 221 days to run. At present the shaft is 475 ft. deep. Considerable work will be done on the 300-ft. level while the shaft is being deepened.—— At a depth of 200 ft. the shaft of the Consolidated Jumbo cut the vein. Favorable assays have been obtained. The vein is 10 ft. thick. A station is being cut and drifts will be driven in both directions.——On August 22 the third dividend of $90,000 was declared by the Engineers' lease on the Goldfield Florence, making a total of $270,000 to date.—— The old Del Monte, two miles from Aurora, is now the property of the Cain Consolidated Mining Co. It consists of 20 stamps and pan amalgamation plant. The mill of the Company, 4800 ft. from the camp, has 20 stamps with an improved cyaniding plant. The Company contemplates changing the process and enlarging the mill to 50 stamps, using electric power.——The mines of Goldfield produced during the week ending August 22 a total of 2941 tons of an estimated value of $231,520. During the same period the production of the Tonopah mines amounted to 6300 tons of an estimated value of $165,550.

LINCOLN COUNTY.

W. W. Hunt is authority for the statement that the New York Searchlight Mines Co. will resume work some time early in September.——The installation of the gasoline engine has been completed on the Pioche-Pacific property, and two shifts have been started to work. The plant is modern in every particular, and will permit of the shaft being sunk to a depth of several hundred feet.——A hoist is to be installed at the Georgia group, Eldorado Canyon, and as soon as it is running, the working force will be increased. The adit on the Dixey Girl claim has been extended 60 ft., making the total length 175 ft.——There is report, as yet unconfirmed, that the Black Hawk, in charge of E. P. Jeanes, is to start up some time next month. It was on this property that a 10-stamp mill was erected about a year ago and immediately following the completion, for reasons never made public, the property was closed down and the mill never operated.

NYE COUNTY.

After a short interval the Jim Butler Mining Co. has again entered the shipping list, the shipments last week consisting of 200 tons to the Belmont mill. Regular consignments will be made in the future.——The water pipe

for Round Mountains' new system has arrived and will be laid as soon as the trenches can be completed. The water will come from Shoshone.——It is believed that the capacity of the Sphinx mill, at Round Mountain, will be increased.——The Manhattan Milling Co. resumed operations at the Lemon mill, at Manhattan, last week. The plant has been completely overhauled and renovated, and new tanks have been added. The initial run under the new management is being made on ore from the Shea lease on the Union No. 9. One hundred and fifty tons are being treated and it is expected that this ore will net an average of $150 per ton.——Stargo, a new camp about 50 miles northeast of Manhattan in the Monitor range of mountains, is attracting considerable attention. A number of Denver companies are operating and have found ore which assays all the way from $3 to $280.

WHITE PINE COUNTY.

The Sapho Mining Co., of which John Weber is manager, last week commenced work on the group of claims owned by the Company near Lane City. The shaft which is now down 41 ft. is to be sunk to the 100-ft. point without delay, after which the Company will decide on further development. The property joins the Ely Northern group and has indications that it contains good deposits of ore. ——Contracts are to be let at once for the building of the fourth unit of the concentrator at Smelter. The second unit of the plant is practically completed and the third will be in operation within six weeks.——The Nevada Northern railroad is to put in a siding to accommodate the Bunker Hill-Sullivan Mining Co., in particular, and the Granite mining district in general. The distance from the new siding to the shaft of the Bunker Hill will be about four miles.

OKLAHOMA.

OTTOWA COUNTY.

(Special Correspondence).—Recent drilling in the new Miami camp has extended the limits of the mineralized field to Narcissa, across the river. Three drills have struck ore. This makes the camp almost continuous from Baxter Springs through Quapaw, Lincolnville, and Miami, and now to Narcissa, extending it for 25 to 30 miles. The whole region is only newly developed, but is richer than most new camps, and has been producing ore at an almost phenomenal rate.——Within two weeks the three new mills at the Miami camp will be producing and will add materially to the output from the Miami Royalty Co.'s land. The new mills are the Index, the King Jack, and the Buckeye. The ground at all three mines is well developed and the ore is ready to be cleaned.——A good strike in the Jennie May mine was reported last week, when the shaft entered the ore at 90 ft. Further development will be done as soon as the orebody is penetrated.——The Miami Yankee has secured a reduction of 11% royalty on its lease, the royalty now being 19%. The ground is well opened with 265 ft. of driving from one shaft. The ore assays 22% zinc-blende and galena. A mill will be built in the near future. ——The new 172-acre lease of H. P. Hall, of Carthage, in the Miami camp has been divided into ten-acre tracts and is being subleased. Already five Carthage companies have been organized and have taken leases. A large number of drills are at work prospecting the land west of Miami and in the vicinity of Fairland some excellent indications of zinc-blende, galena, and other ores have been found. Drilling on Timber hill has resulted in the finding of natural gas at 200 ft. This is the fourth time that a gas find has been made in this vicinity, but none have developed into producers.

Miami, August 22.

WASHINGTON.

OKANOGAN COUNTY.

(Special Correspondence).—The lower adit on the Night Hawk mine is now in over 1200 ft. At the face an orebody, which has been followed nearly 50 ft., is 10 ft. wide. This is reported to be a valuable pay shoot, assaying well in silver and lead, with traces of copper.——Monroe Harmon, manager of the Ruby mine, at the base of Mt. Chopaca, has returned from Ohio, where he has been consulting with his company on the construction of a mill. ——The principal stockholders of the Prize Mining & Milling Co. are expected from Seattle. It is probable that work will be resumed on the Prize mine. The main line of the Vancouver, Victoria & Eastern railway passes within a short distance of this property.

Nighthawk, August 13.

STEVENS COUNTY.

Announcement is made that the Silver-Lead Mining Co., operating near Metaline, will erect an ore roaster and crusher of sufficient capacity to handle the product of its mines. Water to meet all requirements will be taken from the north fork of Sullivan creek and flumed to the claims. Ore cars and other equipment are on the ground. The Company is developing a group of four claims on the Pend d'Oreille river, a mile and a half below Metaline. An adit already started has exposed a body of extremely rich lead sulphates which assay as high as 35% lead and carry some silver.——Spokane mining men have organized the Blue Jim Mining & Milling Co., to take over a property of that name about one and a half miles from the Pend d'Oreille river, below Box canyon. The property was located 22 years ago, and it is said some of the handsomest specimens of gray copper ever shown were taken from the mine, but its owners were not progressive and never developed the property. Among those interested are C. S. Clute, of Spokane, and Charles E. Berry, of Dalkena. The Company will develop the property.

CANADA.

BRITISH COLUMBIA.

Backed by a good supply of coke the B. C. Copper Co.'s smelter has been running smoothly without interruption by the Fernie fire. The smelter treated 13,618 tons of ore during the week ending August 15, as follows: Mother Lode, 9408 tons; Oro Denoro, 3622; other properties, 588 tons.——A. T. Garland and co-owners have given a lease and option on the Mountain Goat No. 2 and Lucky Boy mineral claim in the Jackson basin to L. R. McInnis, Henry Tyo, and Stanley Langille.——The Kootenay Development Co. has taken a lease on the Silver King mine and the Hall Mines smelter, at Nelson. The Company will change the motive power of all machinery to electricity.——Following is the tonnage of ore shipped and crushed at the mines of Rossland for the week ending August 15: Centre Star, 3900; Le Roi, 1050; Le Roi No. 2, 490; total, 5440. ——The machinery in the concentrator built at Trail has all been taken apart and some of it has already been sent to the St. Eugene mine. Some portions will be used in the several plants owned by the Consolidated Co. whenever it can be. This plant came into the hands of the Consolidated Co. when the Centre Star, War Eagle, St. Eugene, and the Trail smelter were amalgamated.

ONTARIO.

The Cobalt Central Mines Co., has begun diamond drilling in the Big Pete mine, to prove up the many veins which have been discovered on Diabase Mtn., and ascertain the most direct and economical method of opening them up for production. The new vein recently found on the third level is about four feet wide and give assays running from 60 to 1000 oz. per ton. Cross-cutting has also begun from the bottom of the shaft on Lot 38, which is now down 117 ft. It is expected that an extension of the Crown Reserve vein will be cut at this level. These crosscuts will also open up other good veins that have been exposed on the surface, one of which shows surface mineralization for a width of 20 ft. that would run $20 per ton. Experience in the Kerr Lake district has proven that the richest ore in the diabase formation is found at a depth of over 100 ft., and it is expected that the work now in progress on Lot 38 will practically double the tonnage of ore available for treatment in the concentrator, the capacity of which has recently been raised to 100 tons per day.

Special Correspondence.

LONDON.

Weardale Lead Co. — Report of Mount Morgan Mining Co. — Output of Selukwe Mine, Rhodesia.

The Weardale Lead Co. is one of the most prosperous and promising lead propositions in Great Britain at the present time. It is situated in a district which has been well known as a lead producer for a great length of time, namely the tract of Carboniferous limestone country forming part of the Pennine chain of mountains between Cumberland, Northumberland, and Durham, situated about midway between Newcastle and Carlisle. The Company's mines are at the head of Weardale in the county of Durham. Operations were commenced in 1883 by the present company. For a good many years the results were not exactly profitable, but since 1905 the output and income have considerably advanced and the Company is now prosperous. This favorable state of affairs is due to the ability of the present manager, Mr. Errington Thompson. During the year ended June 30, 1906, the produce of the smelter was 2370 tons of pig lead, and the profit £15,641; the next year showed an increase to 3230 tons output, and £30,194 profit. The result of the year's working for the year 1907-8 shows an advance in the output to 3519 tons of pig lead, but owing to the slump in metals the profit is only £19,220. Out of this profit £1000 is being placed to dividend-equalization fund, £9791 is distributed as dividend, being at the rate of 12% on the capital paid up, and a similar amount is being placed to capital account. The Company in 1900 had a capital of 97,919 shares of £1 each, of which only 15s. had been paid up, thus leaving a liability of 5s. per share. During the year 1906-7, £9791 was placed to capital-account, and 2s. liability on the shares was cancelled. By a similar proceeding during the past year, the liability has been reduced by another two shillings, leaving a liability of only one shilling. In 1900 it was expected that the shareholders might have been called on to provide further working-capital, but the subsequent able development of the mine has relieved shareholders of this prospect, and has in addition provided out of profits an additional working-capital of nearly £20,000. Nor is this the only financial advantage reaped by the shareholders from the present management, for £10,000 of debentures have also been wiped out of profits. The mines are opening up well and the prospects are bright.

The report of the Mount Morgan Gold Mining Co. of Queensland for the year ended May 31 last, shows a profit of £263,363 out of which £255,000 has been distributed as dividends. The total production was 5561 tons of copper and 153,092 oz. gold, and the receipts were £911,723. The fall in the price of copper affected the profits, for during the first half of the financial year the average price obtained was £105, and during the second half £65. The result of the year's operations may be called an average one, for the variation in price prevented the profits from being either too inflated or depressed. The gold is obtained from three sources, namely, from the oxidized ores, from the sulphide ores by chlorination, and from the copper-smelting furnaces. From the first source the production was only 21,010 fine ounces from 123,469 tons, which is 3.4 dwt. per ton. This ore is rapidly being exhausted, and what remains is very low grade. Five years ago the yield was 70,456 oz. from 112,487 tons, and the average value has dropped in successive years to 10, 8, 7, and 5 oz. until it is now 3.4. Of sulphide gold ore 117,770 tons yielded 64,150 oz. gold, and 441 tons of copper. This yield of gold is nearly 11 dwt. per ton, and is practically at the same figure at which it has stood for five years. On the other hand, the improvements in treatment have yielded a continually increasing output of copper. In the smelting department 155,714 tons of ore were smelted, yielding 5120 tons of copper, and 67,931 oz. gold. This is a considerable increase over the previous year, and it is due to the fact that a third furnace was started at the beginning of February. It is interesting to note that the estimates of copper ore made in 1905, when smelting was commenced, have proved remarkably exact. No further prospecting work has been conducted, but the ordinary mine development has opened up large bodies of ore which amount approximately to three million tons. In addition there are very large reserves of low-grade ore running 2½% copper and 1½ dwt. gold. At the present time it will not pay to treat these. The Mount Morgan ore requires large addition of fluxes, and owing to the exhaustion of fluxing ore in the mine, a great deal of barren flux has to be brought up. At the present time, with three furnaces in operation, the rates of consumption of ironstone and limestone per annum are 52,000 and 130,000 tons respectively. As I have before mentioned in this column the Company has in hand the development of a mine at Many Peaks, from which fluxing ore will be brought to the smelters, and on completion of the necessary railway, 100,000 tons of this ore will be used every year. Not only will the capacity of the furnaces be increased in this way, but it will be possible to deal with the lower-grade ore which is not at present profitable.

The Selukwe is one of the oldest of the Rhodesian gold mines. It commenced operations in 1898, and for a few years did pretty well on 14 to 15 dwt. ore. When the number of stamps was increased from 20 to 40 head, and a cyanide plant was added, the Company made profits sufficient to pay dividends. On the capital of £321,000 dividends of 10% were paid in August 1902, February 1903, and August 1903. This capital is, of course, too much, but it is what we have been accustomed to under the wing of the British South Africa Co. Some of the shares were issued at 100% premium, and the market quotation at one time stood very high. Unfortunately the grade of the ore has fallen off, and the output dropped from 50,000 bullion ounces in 1902 and 1903 to 26,288 oz. in 1904. During the year ended March 13, 1907, the output was 25,446 bullion ounces, which realized £87,006. Of this 19,517 oz. came from the batteries, and 5929 oz. from the cyanide plant. The average yield over the plates was 5.27 dwt. per ton, and from the cyanide plant 2.39 dwt. The working costs of mining and milling were £56,117, and of cyaniding £7291, leaving a mine profit of £23,598. In addition £19,764 has been spent in development, and £16,799 has been written off for depreciation, so that there is an adverse balance of over £13,000. The development work has opened up increased bodies of ore, but the grade does not improve. The ore reserves at present amount to about 150,000 tons, which is equal to a two years' supply.

KALGOORLIE, WESTERN AUSTRALIA.

Developments in Great Boulder and Main Reef.—Wood-Cutters' Strike. —Local and Imported Coal.—Kalgoorlie Power Co. — Results of Electric Tramway Operation.

The State's gold production for June totalled $2,900,000, to which Kalgoorlie contributed $1,700,000. So far this year, production is holding its own with last year, but a decrease for the whole year is certain, as several of the larger mines are reducing yields. Nothing out of the ordinary is reported in general development work, excepting that much interest is taken in the opening out at the 1550 ft. in the Kalgurli, 1800 ft. in the Ivanhoe, and sinking the main shaft at the Great Boulder to 2400 ft. A great deal of speculation is rife as to the probability of the Great Boulder shoot dipping into the Main Reef property on the south end of the former. What appears to be the end of the shoot at 2150 ft. in Edwards' shaft is some 600 ft. north of the Main Reef boundary. Some people calculate that the latter lease will get good ore at 3000 ft., others below 4000 ft.; anyhow such talk only tends to weaken the shares of the Boulder Co., while people are nibbling at Main Reefs.

A strike, not quite general so far, has occurred among the cutters and carters out in the bush, and if it con-

tinues much longer the position of the mines will be serious. For the fuel supply of the mines here, several firewood companies have been formed, and they have laid down light railroad lines, from the main Government railroad, far into the scanty bush. About 1500 tons is the daily requirement of the mines, and few have enough room to stack any reserve of fuel, so if regular supplies cease, there is no alternative but to shut down. About 800 men are at work for the several firewood companies, and the trouble is that they want more wages for cutting, carting, and truck-loading, as well as some different arrangement about stores, board, and lodging. So far, the firewood people will not concede any of the demands of their employees. We have no coal in this State suitable for general mine-work, that from Collie field in the Southwest district is of very poor quality, and will not stand much handling. Even on the Government railways a mixture of Newcastle (N. S. W.) and Collie is used, although the drivers would prefer only the former; in fact, it is practically only the Government consumption that keeps the Collie mines going. During the last year or two experiments have been made with briquetting the local coal, and having trials made on coastal steamers. The former was hardly a success. Although there is a good deal of timber still standing that can be cut for fuel, the time will come when we must experiment with the local coal, or use that from New South Wales, or fuel oil from America and the East.

Early in June the rains filled the Mundaring reservoir, and the water is now running over the weir, so we have again 4,680,000,000 gal. to draw upon. The dam fills regularly every year at about this time. During 1907 the Kalgoorlie Power Co. made a profit of $130,000. This company has a large plant of three vertical engines made by Stewart & Co., of Glasgow, with General Electric generators, one horizontal cross-compound engine by Tosi of Italy, with generator, and it is now putting in a fifth engine of about 1000 hp. The Company supplied power to the electric tramways, to the mines, and for private lighting in what is known as the Roads Board district, the municipalities of Kalgoorlie and Boulder City having their own large lighting stations. The 1907 report of the Kalgoorlie electric tramways shows the following figures, in each case there is a fair decrease in the returns for 1906, due to local depression and to keen competition with the Government suburban rail service:

Car miles	650,530
Passengers	3,052,241
Power consumed, units	930,231
Cost of power consumed	$52,000
Gross receipts	$240,000
Net profit	$80,000
Miles in operation	20½

The output from the various mines for June was as shown below:

Name.	Tonnage.	Yield.	Profit.	Dividends.
Associated Gold Mines	10,354	$105,000	$32,000	.....
Associated Northern	3,610	43,000	20,000	.....
Gt. Boulder Proprietary	15,962	244,000	120,000	$325,000
Great Boulder Perseverance	15,701	100,000	16,000	.....
Great Fingall	21,349	175,000	65,000	.....
Golden Horseshoe	22,873	255,000	100,000	.....
Hainault	5,947	30,000	1,200	.....
Ivanhoe	18,823	210,000	105,000	.....
Kalgurli	10,845	128,000	81,000	.....
South Kalgurli	9,036	61,000	5,000	.....
Lake View Consols	9,160	65,000	11,000	.....
Oroya-Brownhill	11,714	80,000	21,000	.....
Oroya-Black Range	4,230	51,000	20,000	.....
Sons of Gwalia	12,816	90,000	18,000	.....
Sons of Gwalia, South	1,990	25,000	11,000	.....

The milling grade of the ore at the Associated Northern is to be brought down to 8 dwt. per ton, in order to utilize the large amount of low-grade reserves.

MEXICO.

Agitation Against Mining Law Revision. — Tariff on Manufactures of Iron and Steel.—Suggested Increase in Freight Rates on Fuel.—Activity in Utilizing Water-Power Resources.—Improvements at El Oro.

From almost every State of the Mexican Union come protests because of the proposed new mining law. Not only are these complaints made in connection with mining matters, but other industries are laying their troubles upon this measure for disturbing the serenity of foreign capitalists. Though the deplorable conditions began to manifest themselves as a result of the financial troubles of last fall and before the proposed revision of the mining law was made public, nevertheless that must now be made an object lesson and bear the blame. Undoubtedly some important enterprises have been held up, and without doubt the present was an inopportune time to present the changes contemplated in the prohibitory articles in the new measure. All possible advantage is now unquestionably being taken of these articles to make them the scapegoat for the prevailing business difficulties. But as our troubles never come singly, the miner may soon forget the proposed mining law in the consideration of others that are upon us, one of which is the new tariff on iron and steel which went into effect on August 15. It is in part as follows: plain steel bars 6c. per kilogram (2.2 lb.) gross weight; worked and adorned steel bars and iron bars, 7c. per kilogram gross weight; iron and steel rails, 2½c.; screws, clamps, joints, and nails for rails, 3c.; steel beams and joists, 3c.; joists, beams, and columns of iron, when therefore rated, 5c. This tariff is for the purpose of stimulating manufactures in the country and for the protection of the Mexican plants already in operation. Added to this is the effort, either on the part of home producers or of the railroads, to have freight rates on imported coal and coke raised by about $1 per ton, depending on the haul, as for example, from Vera Cruz to Mexico City, from $7.50 on coal to $8.50, and from $8.50 to $9.50 on coke; and from Tampico to Monterrey (which is nearer the great Mexican coalfields of the State of Coahuila) an increase on coal from $5.06 to $6.21 and on coke from $6.06 to $7.21. The rates quoted are now before the Government railway commission, but it is not believed such discrimination in rates will be allowed. It is stated that an effort to have an import duty placed on coal or coke would be equally futile, so the mines and smelters, which are the largest consumers of fuel, probably have nothing to fear on this score. The miner still has hanging over his head the proposed increase in the freight rates of 10, 20, and 30%, respectively, in ores under $25 valuation, between $25 and $50, and over $50 valuation per ton, and which though held off now for many months will undoubtedly be fastened upon the shipper as soon as the general financial conditions and the metal markets will permit.

All of this, however, cannot seem to direct the attention from worthy enterprises and considerable new work is being carried out on all sides. Most noticeable during the month of August has been the number of concessions sought from the Federal Government for water-power on the various rivers throughout the Republic. Scarcely a day has passed that a request has not been made for water rights for power purposes in some one of the States of Chihuahua, Sonora, Sinaloa, Tepic, Hidalgo, Jalisco, Guerrero, or Puebla. In most instances they have been for mining enterprises. The great saving which has been effected in the camps, such as Guanajuato and El Oro, where the electric power from hydro-electric plants has been introduced, has brought the matter vividly before the public. In the camp of El Oro, State of Mexico, the replacement of steam by electricity has been the pioneer move, for Mexico, of the Dos Estrellas Co., which has decided upon electric locomotives for its railroad between the mine and the mill. It has ordered three for this purpose, which number will be increased later on. Another important improvement in the camp of El Oro is that of the Ezperanzas Co.,

which is installing a plant of ten tube-mills, to which will be added twelve 'Pachuca' agitation tanks for cyanide work. When these improvements and additions have been completed the old tailing dumps of the Esperanzas company will be re-treated. The Descubridora is still working with promising prospects. The Chihuahua, as mentioned in a previous letter, hopes to resume at the same time as the Reina y Anexas Mg. Co. The English company, which had an option on the Victoria at $300 per share, has, by reason of the financial troubles, allowed its time to lapse, and the Victoria company has determined to continue searching for the Verde vein of the Dos Estrellas, which was lost by a fault. It will drive cross-cuts from both the Victoria and the Union shafts, which it is estimated should not exceed 40 and 60 metres respectively, and should be concluded in less than four months at a cost of $14,000. The money for this purpose has been raised by selling the 165 forfeited shares to H. H. Simpson at $100 per share. The Victoria lies between El Oro and Dos Estrellas, and the great San Rafael vein of the camp is known to dip into the Victoria, at a depth of 2100 feet.

CANANEA, MEXICO.

Resumption of Operations on Large Scale. — Labor and Wages. — Output of Mines. — Methods of Handling Materials. — Use of Crude Oil for Fuel.

With all the mines being operated, three of the four units of the concentrator plant running, and four of the eight new blast-furnaces with two convertors and the reverbatory furnace in operation, the resumption of work at Cananea is well under way. At present the total number of men employed is about 2700, of whom 2070 are Mexicans, and 630 belong to other nationalities, mostly Americans. These men are distributed among the different departments as follows: mining, 1300; narrow-gauge railroad, 150; concentrator, 240; smelter, 400; mechanical construction, 200; with the remainder in the mercantile, accounting, and bank departments, and under the head of miscellaneous. Wages for all classes of labor are considerably lower than before the shut-down in November. In general white men have been cut 50c. per day. As an illustration, mechanics formerly received $4.75 for 10 hr., while now they get $4.25, and white helpers have been reduced from $3.50 to $3 per day. Mexican labor runs from $1 to $2.50 gold, governed by the class of work. On all outside common labor, where very little skill is required, such as shoveling, running cars, and roustabout-work, they receive $1 for 10 hr., and the scale varies from that up to $2.25 for the highest-paid men in the mines, with 25c. per day bonus if they work 26 days per month. Aside from this general reduction in wages the efficiency of each man is greatly increased; this is due partly to the more active and progressive tone in the camp, and partly to the fact that there is an abundance of labor of all classes, so that more can be demanded of the men.

The mines are at present shipping about 2200 tons of ore, iron, and silica to the concentrator and smelter per day. Of this amount 1450 tons is second-class ore sent to the concentrator. Of first-class ore 485 tons are sent directly to the spreading-beds and 200 tons of iron and 65 of silica for flux and convertor-lining respectively. In addition to this there is some lime-rock put onto the spreading-beds, the amount depending on the per cent of lime already in the mixture, mainly in the Elisa and Puertocitos ores.

The Cananea-Duluth mine is probably receiving the greatest amount of attention just now, about 330 tons of ore being shipped daily, of which 200 tons are being mined and the remainder taken from the dump. Until recently the entire output has been going to the concentrator, but now shipments of first-class ore directly to the spreading-beds have been started. The mine is being worked with two shifts, with about 100 men on a shift. The system of mining used almost exclusively is back-stoping, taking out 100-ft. sections. The ground holds well, round stulls, supporting the back as the stope is carried up, being the only timbers required except the regular chute and raise-timbers. The ore as shipped carries from 3 to 4% copper, 5 to 6 oz. silver, and 60 to 80c. gold. The Oversight mine is producing about 800 tons per day, both first and second-class ore. Here the top-slicing system of mining is in use, caving the ground as the slices are carried down. The ore is worked in 50-ft. blocks. The ground is soft and caves readily. The Veta Grande is producing about 265 tons daily. Here the ground is harder, and is worked in blocks of 45 by 55 ft. by the caving system. There are at present 13 of these blocks of ore, broken down ready to be drawn out, the thickest of which, from top to bottom, is 165 ft. The other two producing mines are the Elisa and the Puertocitos, the Elisa with underground workings, while the Puertocitos is an extensive surface orebody, worked in large quarry-faces.

The concentrator, which consists of two mills of two units each, is handling a good tonnage, but is not being pushed. All of the new mill is running. It has a daily capacity of 750 tons per unit. One unit of the old mill, which has a daily capacity of 500 tons per unit, is also running. The ore handled carries from 2 to 5% copper, and averages about 60% in silica. The ore concentrate, iron, and lime are delivered by means of narrow-gauge cars into bins at the sampling mill. From these bins they are carried by means of conveyor-belts into the mill, where, with the exception of the concentrate which is sampled at the concentrator, they are carefully sampled. Passing through the mill by a system of conveyors and chutes onto another belt, they are run out over the spreading-beds and dumped by means of a tripper moving rapidly from one end of the bed to the other. The tonnages and a complete analysis of all material as it is laid down on the beds is known, so that any smelting mixture that is desired can be had. There are three of these spreading-beds, each with 10,000 tons capacity. From the beds the ore is handled by a new type of reclaiming machine. The machine is driven by two electric motors, one moving a harrow back and forth on the face of the ore-pile and revolving a chain, with numerous cast-iron plows attached, which discharges the ore at one side of the machine onto a conveyor belt; the other motor advancing the machine into the ore-pile. The capacity of this reclaimer is large, as the four furnaces are supplied with one machine running less than half the time at its lowest speed. So far these reclaimers have given considerable trouble on account of break-downs owing to small faults which are rapidly being overcome as the machines are becoming more perfected. The inventor, who is also the engineer for the manufacturers, the Robins Belt Conveying Co., is on the ground, and there is little doubt that the reclaimers will within a short time be improved so that they will cause no further trouble. The ore is conveyed up an incline and discharged by means of another tripper into the steel bins over the furnaces from which it is fed directly into the furnaces.

The four blast-furnaces, which are in operation, are handling between 1500 and 1600 tons of charge daily. The date for blowing-in additional furnaces is not yet decided. With the new system of feeding the furnaces the labor expenses is greatly reduced, ten men per furnace having been cut off.

The flue-dust from the furnaces is run in cars to the reverberatory, which is handling about 150 tons daily. Oil from the Texas oilfields is being used for fuel in place of the finely-ground coal in use before the shut-down, and is giving good results. The consumption is about 190 barrels per day. Two convertors are being blown continuously. The copper-production at present averages about 57 tons daily.

Within the last few days the boilers at the main power-house have been using oil, and within a reasonably short time oil will be in use throughout the entire plant. The oil is unloaded into tanks above the smelter, from which it flows by gravity to the power-house, and to the concentrator, and will be pumped up to the older mines. A third-rail, making it a standard-gauge track, is now being laid

to the Cananea Central mines so that oil can be delivered there directly. As far as can be learned the management of the company is well pleased with the showing made so far in all departments.

BUTTE, MONTANA.

North Butte Mining Co.'s Developments.—Great Falls Smelter to Resume September 1.— Pittsburg & Montana New Concentrator.—Montana Mine Owners' Association. — Panhandle Smelter to Blow-in.—Reins Co.'s Bond Issue.— Raven Mining Co. — A Schoolmistress in Rawhide. — North Butte Extension Issues Bonds.

The North Butte Mining Co. has started cross-cutting for the Edith May and Jessie veins from the 2000 and 2200-ft. levels of the Speculator. The stations and skip-pockets were completed during the past week, and the Edith May vein, because of its dip to the south, was cut in one corner of the station at the 2200-ft. level. The vein has not yet been fully cut through at that point, but the portion opened shows that vein to be of the same character as it is at 1800 ft., where the Company has been mining chiefly during the past two years. At 2000 ft. the vein is less than 100 ft. from the shaft. In a short time the Edith May will be opened on both the new levels, and 400 ft. of additional stoping-ground added to the company's ore-supply. A long cross-cut will be necessary to reach the Jessie vein, which lies north of the Edith May, with the Granite Mountain, owned by the Lewisohns, between them. The levels at the 1800 and 1600 ft. were driven through the Edith May and Granite Mountain into the Jessie.

By the first of the month the repairs on the damaged smelter of the Boston & Montana Co. at Great Falls will be finished, and ore shipments to Black Eagle Falls will be resumed, but not more than 1000 tons per day will be added to the present output. During the shut-down of the Great Falls plant the Washoe smelter at Anaconda has been overcrowded to the extent of nearly 2000 tons per day, and that plant will be greatly relieved. With a resumption of operations at Great Falls and all the mines of the Boston & Montana Co., the Butte district ought to make another record for copper production, as everything will be running at full blast, with the exception of the St. Lawrence mine of the Anaconda Co., which is still hampered by the prevalence of gas in the upper levels, coming from the fire which has been burning in that property since 1889.

The Pittsburg & Montana Co. has completed its new 300-ton concentrator-building and is installing the machinery. The Company will soon increase its output, and with the concentrator will be able to work a lower grade of ore. The Davis-Daly Estates Copper Co. is confining its work to the Colorado shaft, which is being sunk deeper. It is now about 1200 ft. deep. Ninety feet was sunk in July. No mining is being done, and only a few lessees are engaged in the Plymouth and Silver King mines.

Something seems to have gone wrong with the Montana Mine Owners' Association, which was organized to fight the smelter trust. A working committee was appointed and instructed to secure the Panhandle smelting plant at Ponderay, Idaho. Progress was reported, and the independent mine operators in Montana were notified to get ready for ore-shipping. Various dates were set for blowing-in the smelter, and then all talk ceased and the committee and the officers of the new association became so silent as to attract notice. Evidently the men in control of the new association have gone out of the business of trust-fighting. The latest information is that the Greenoughs, owners of the Snowstorm mine at Mullan, Idaho, have secured control of the Panhandle smelter and will start it up soon. It is stated that a large deposit of iron ore on Lake Pend d'Oreille goes with the smelter, which will provide flux for the Snowstorm copper ore. The Greenough's have no smelting facilities, and have been able to sell the Snowstorm ore only as it was wanted by the Washoe and other smelters for converter-lining. Now the Greenoughs appear to have solved their smelting difficulties, if the story of the big iron-ore deposits be true. The Panhandle smelter will be able to handle 250 tons of ore per day, and the Snowstorm can more than supply that amount, so that the Montana Mine Owners' Association will have to do some more figuring.

The Copper Eagle Mining & Smelting Co., which owns a silver property north of Butte, has resumed operations after a long shut-down, having raised funds needed to carry on development work. The shaft will be sunk 100 ft. additional. A good body of ore has been found on the 250-ft. level.

The stockholders of the Reins Copper Co. have voted to issue $600,000 in 6%, nve-year, first-mortgage bonds. The mortgage will cover all of the Company's property in Butte, including the Combination, Ella, and Louise quartz lode claims, and all the equipment. The special meeting was largely attended by local stockholders, and some opposition to the bond issue was manifested, but it was represented that it was a bond issue or a re-organization of the Company. Nearly all of the Company's 1,500,000 shares of stock was represented, a large majority being voted by proxy by Secretary W. F. Johnson, who came from Pittsburg to attend the meeting as the representative of Colonel J. H. Guffey and his associates. About a year ago the capital stock of the Company was increased from 1,050,000 to 1,500,000 shares of the par value of $1.50 per share, but that did not meet the necessities of the Company. Colonel Guffey and his friends spent a great deal of money in trying to develop a copper-producing mine, but the big and rich Colusa-Leonard vein, for which they were searching, proved elusive, and while some good ore has been found on the 1200-ft. level it is not extensive. About two years ago the stock of this Company sold at about $3 per share, and last February it sold as low as 9c. per share. It is now quoted at 40c. again.

The Raven Mining Co. is not sinking the shaft deeper on the Raven claim, but is engaged in sinking a winze on the vein at the 1100-ft. level. Two veins were cross-cut and considerable driving done on the best of the two. Some encouraging assays were obtained, but the copper was not present in paying quantity. The vein will be explored at greater depth through the winze. The shaft is an incline, and the 1100-ft. station has a vertical depth of only about 750 ft. The miners in the winze plainly hear the machine-drills in workings of the Anaconda Co., presumably from the Buffalo mine.

Miss Margaret Laughrin, formerly a school teacher in Butte and county superintendent of schools for four years, has become a mine operator and newspaper owner in Rawhide. She was reared about the mines of Butte and acquired a broad and technical knowledge of mining, which she has put to good use in Nevada. She has been back in Butte for several weeks, and there is no one from Nevada that is a greater booster for that State than is Miss Laughrin. She says Rawhide has been 'knocked' by the envious and malicious, but in her opinion it is the greatest gold district in Nevada. "The trouble with Rawhide," she says, "is that the town outgrew the mines, and the town had to have a set-back. Then the financial panic came and it hit Rawhide as badly as any place, but the mines are getting better every hour. Development work has shown conclusively that the veins go down. Rich ore is being taken from the Kearns No. 2 lease at a depth of 300 ft., and the shaft is in the same character of ore 25 ft. deeper. New strikes are made almost daily, and we now have 20 shippers. The number is constantly growing. The Kearns lease was purchased for $35,000 and the profits paid for it in less than a week. Some of the richest ore in the camp was found at a depth of three feet in the Grutt Hill Mint." Miss Laughrin is also interested in Goldfield. She owns a tenth interest in one of the best mines in Rawhide, and has interests in others. She is also half owner of the Press-Times Publishing Co. E. W. King, once owner of the somewhat noted Barnes-King

mine of Montana, is also largely interested in Rawhide and has been in Butte for several days. He is said to have purchased the Baloon property in Rawhide for $125,000. Mr. King disclaims any connection with the notorious Barnes-King deal.

It is announced that the financial difficulties of the North Butte Extension Co. will be met by the issuance of $400,000 in bonds, bearing 6% interest, maturing in five years. Some of the large stockholders are ready to take $200,000 worth of the bonds at once. The remaining $200,000 will be retained in the treasury. The Extension Co. owes a considerable sum of money on unpaid operating expenses and options, but it is said these will soon be paid, and operations on the property will be resumed.

Butte men are engaged in exploration in a new copper district, in Jefferson county, 16 miles from Butte, and 11 miles southwest of Boulder. The first company organized to work there is the President Copper & Gold Mining Co., incorporated under the laws of Montana and capitalized for 1,200,000 shares of the par value of $1 per share. The Company takes over 11 claims on which Dr. Ferdinand Grattan, of Butte, has been doing development work for a year or more. The claims are located along a vein for a

Map of Butte District.

distance of a mile and a half. The vein on the surface is from 30 to 60 ft. wide, and has been explored by two shafts sunk 3000 ft. apart. One is 210 ft. deep, and the other 80 ft. The officers of the Company are: President, Ferdinand Grattan; vice president, C. S. Shoemaker; treasurer, Walter Tallant; secretary, Joseph Chauvin. These, with William Creden and H. P. Bennet, comprise the board of directors.

SALT LAKE, UTAH.

Competition Between the United States S. R. & M. Co. and the American Smelting & Refining Co. — Congestion at Garfield Smelter. — Boston Consolidated Production. — Conditions in Beaver County.

The United States Smelting, Refining & Mining Co. is seeking to draw ores from the channels which have heretofore supplied the Selby plant near San Francisco. No sooner had word gone out that the latter would be closed because of trouble over smelter fumes, a condition which forced no less than three copper smelters in the Salt Lake valley to the scrap pile, than emissaries of the United States S., R. & M. Co. were dispatched to the field seemingly left temporarily without a market. While some ores have been obtained, it is said, their efforts have not been entirely fruitful of results. The fact is, and this probably accounts for the unsuccessful mission of these agents, the Murray smelter of the American Smelting & Refining Co. could handle a very much larger tonnage than it has been doing for some months past; hence it is reasonable to presume that patrons of the Selby smelter will be taken care of elsewhere in some one of the so-called Guggenheim, or A. S. R. plants—preferably at Murray. This smelter has scarcely been operated at more than half its capacity since the beginning of the present year. The building of the smelter in Tintic by the Tintic Smelting Co., which is just being placed in commission, has cut off a large tonnage from the Tintic district, which in the past has been the chief source of supply for lead ores to the Murray smelter.

The situation at Garfield is exactly the reverse. There more ore has been coming in than can be taken care of conveniently. The furnaces have been swamped; the yards are congested with ore representing an investment of hundreds of thousands of dollars, which comes as a legacy from metallurgical troubles not anticipated when the plant was built, or when contracts with some of the principal shippers to it were signed. The fine concentrate from the mills of the Utah Copper and Boston Consolidated companies have presented conditions entirely unlooked for. It is this situation that has made the 800 tons of ore coming daily from the Utah Consolidated mine at Bingham burdensome to the smelting company, and that is why the latter has been loath to enter into a five-year contract to become operative when the present one expires. It is expected, however, that the question of a new contract with the Utah Consolidated will be definitely determined before the end of September, when it will be decided whether the Utah Consolidated shall go to the expense of building a smelter to take the place of the one made idle through the operation of an injunction of court. The lead department of the United States smelter is operating four furnaces under an oxidized charge, and has also several roasters in the battery of converter roasters working on sulphide ores.

It has been ascertained at the offices of Samuel Newhouse that the Boston Consolidated mine will be prepared to contribute 1600 tons of porphyry-ore to its Garfield mill by September 15, and accordingly, the mill management is getting four additional sections in readiness to receive it. This is taken as an indication that the management of the Garfield smelter will have overcome by that time some of the difficulties noted hitherto. With these other units in service the Boston Consolidated should produce from 1,000,000 to 1,200,000 lb. of copper in October. The August production will aggregate a little over 700,000 lb., against 691,460 lb. in July, representing the yield from 21,500 dry tons of porphyry-ore sent to the concentrator, and 6013 tons shipped direct to the smelter. The July mill extraction was 68.5%, 16.5 tons being concentrated into one.

Mining conditions in Beaver county show material improvement. An evidence is seen in the acquisition by a syndicate of Utah mining men of a large area contiguous to the Horn Silver mine at Frisco, in the organization of the King David Mining Co., with the commencement of development upon a large scale, and in the consolidation of the Cedar and Talisman mines. In the Cactus mine of the Newhouse Mines & Smelters corporation, development carried to the 900-ft. level has revealed the orebodies which had been exploited on the upper levels. The company is milling from 18,000 to 20,000 tons of ore monthly, shipping some crude ore direct to the smelter, and producing about 500,000 lb. of copper per month. A consolidation of the Wasatch and Skylark copper properties has also been effected, while numerous other mines in the county are active. Outside the Horn Silver and Cactus, the Moscow is a leading shipper, producing considerable lead ore. The Majestic Mines Co., is doing some effective work at the O. K. mine, which has produced considerable high-grade copper ore in the past.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Wages of watchmen have generally been adjudged as applying on annual assessment work when the mine is idle, or when there is portable property needing protection.

Solder for gold consists of 14 parts gold, 6 silver, and 4 copper. Silver-solder may be either 70 parts yellow brass, 7 zinc, and 11½ tin; or 145 parts silver, 73 brass (3 copper, 1 zinc), and 4 zinc.

The alternate-shovel method of sampling ore is cheaper and quicker than the coning and quartering method, and is apt to give a closer approximation to absolute accuracy, unless the coning is very carefully done.

Road work, if done for the actual benefit of a mining claim, may be counted as annual labor, but if only for the benefit of the district adjacent, even though it be on the claim, it has been held that it could not apply as annual labor.

The relative strength of beams is given by the ratio of the products of the breadth and the square of the depth. Thus, if it be desired to see whether a 4 by 6 in. timber will make as strong a joist as a 2 by 8 in., the method is as follows: $4 \times 6 \times 6 = 144$, and $2 \times 8 \times 8 = 128$; therefore the former is 1.12 times stronger than the latter.

Gold is reported by a correspondent as occurring upon mica in the form of a film. In answer to the question whether such an instance has a parallel, we must confess that the case evidently stands alone. It may be true; there is no reason in the world why it might not be; but previous occurrences have no bearing upon the matter. 'Gold is where you find it'; it is either on that mica, or it isn't. An assay will give the answer, and no other answer is worth anything.

The velocity of flow from an orifice is theoretically the same as that acquired by a body falling from rest in a vacuum through a height equal to the head of water on the orifice. Practically this value is never reached, and for orifices with sharp edges in thin plates, the actual velocity of flow in feet per second is $C\sqrt{2gh}$, in which C is a coefficient varying between 0.97 and 0.99, g is the acceleration of gravity in feet per second (32.16), and h is the head, in feet, on the centre of the orifice.

Candle-power is a definite unit, fixed by law in civilized countries. The British unit of light, or candle-power, is the amount of illumination given by a sperm candle ⅞ in. diam. burning at the rate of 120 gr. per hour. An international congress held in Paris in 1890 established a light-unit, known as the 'decimal candle,' which is the amount of illumination from the one-twentieth part of a square centimetre of molten platinum at the temperature of solidification. This unit is equal to 1.02 British candle-power.

The metre, the standard unit of length of the metric system, was intended to be one ten-millionth part of the earth's quadrant, that is, that portion of a meridian embraced between either pole and the equator. The original measurements and calculations, made by La Condamine in Ecuador, South America, in 1745, by means of which the standard metric-bar was prepared, have been found to be slightly in error, but the length of the standard remains the same. A re-measurement of a meridian at the equator was made a few years ago by another French commission of astronomers.

The 'Eads mud-pump' was designed by the builder of the St. Louis bridge for use in the caissons of that structure. The principle involved is the same as that employed in the atomizer and the injector, that is, the principle of the induced current. The mechanical arrangement is such that a stream of water with a high velocity is discharged on the outside of a small pipe, which produces a partial vacuum in the latter, when the pressure of the air on the outside forces the mud through the small pipe and into the current of water, by which the mud is carried away. The current of water is the motive power which carries away the material, the induced current being used only to deliver the mud to the discharge pipe. At the St. Louis bridge a pump of this design with a 3½ in. suction was capable of raising 20 cu. yd. of material 120 ft. per hour, the water-pressure being 150 lb. per square inch.

The Venturi meter is the only practical device for measuring the flow of water through a large pipe. It is available for mains up to 60 in. diam., and by means of an ingenious automatic recording-apparatus a continuous record may be had of the exact rate of flow at any moment. The Venturi meter causes less loss of head than any other style, and since it has no moving parts, is less liable to clog and incapacitate the system. In its essential form the Venturi meter consists of a simple contraction of the area of the main to about one-ninth of its full area, and hence the velocity through the throat is nine times that in the full section. Piezometer tubes inserted at the throat and at the full section of the pipe just ahead of the throat, show the actual difference of head due to the difference of velocities, and if no loss of head between the two sections be considered, the quantity of water flowing is dependent only upon the difference of the heights in the two piezometer tubes. In practice there is a small loss between the two sections, and hence the actual discharge is slightly less than the theoretical. The Venturi meter, so-called in honor of the distinguished hydraulician who first developed the principle by which it operates, was invented by Clemens Herschel in 1887. The cost of these meters is about as follows: for the 6-in. size, $600; 12-in., $770; 24-in., $1130.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Rights of the Miner.

The Editor:

Sir—In relation to that most readable, instructive, but somewhat fallacious article by Theo. F. Van Wagenen, on 'The Rights of the Miner,' in your issue of May 16, I make the following brief comments. A 'tax for right to prospect' is, after all, a small matter, merely a nominal charge of 10s. or so, obtainable by all desirable persons, and bestowing on each recipient the right of prospecting or owning property. In the United States, on the other hand, where there is no such privilege, what do we find? No one, except with the rights of citizenship, full or partial, can hold against a claimant any unpatented mining claims. Surely the small charge for a 'miner's right' seems worth the money to an alien and is a light tax to a citizen. As for labor conditions. Take, for example, Western Australia, where the labor conditions are severe, necessitating one man, costing about £3 per week, to each 6 acres, and after approval, one to every 3 acres. The 'law of the apex' cuts little figure to the prospector in such a country compared to such onerous labor-conditions. Yet as far back as 1903 we find Western Australia overrun by as hardy a race of prospectors, or 'diggers' as they call them there, as any 'sour dough' that ever tossed a 'flapjack,' or 'humped his way' in the Western State. That prospecting in that part of Australia has not been more general in recent years is not because the digger does not enjoy the blessings of the 'apex law,' but because he is cursed with such labor-conditions. Compare the $100 per annum, and no necessary record of work performed in the United States. In the latter country the work may be omitted for years it may be, with next to nothing done, without forfeiture, whereas, in the other instance, one day's omission, without 'exemption' renders any claim forfeitable, and neither is there such fixity of tenure as patenting gives. Such countries, if they suffer today from a dearth of the true genus 'prospector,' do not suffer because of any lack of the 'apex law,' or because vertical side and end-lines are in force. It is a matter of onerous labor-conditions, excessive royalties, and the like. In South Africa the country is either held by large syndicates, or the laws are expressly favorable to capitalists, so that the prospector by restrictions of search and absurd royalties is not given a fair show. I am under the impression that Rhodesia has, or had, the 'extra-lateral' law. However that may be, the poor prospector finds little encouragement, and usually leaves in despair or disgust. Siberia is another instance of a vast country, with immense mineral resources, effectually locked up either by large grants or impossible conditions and restrictions upon the foreigner. I have no doubt, from long custom, the prospector has a decided preference for this law, fancying he will be defrauded from his rights by any change to vertical side-lines. This, in most instances, is purely imaginary. Let go of the absurd restriction of 'finding mineral in place' on Government mineral lands; let the claim be 'pegged' without reference to any supposed 'discovery,' so that the dip of the lode can be protected by the full width of the claim. Then if the prospector is still unsatisfied, let him take up as many 'deep' claims as he chooses. He will have all the more to sell, when he has proved the worth of his outcrop claim, or when some capitalist has proved it for him.

Why I have characterized the article as 'fallacious' is mainly because the deductions seem illogical. For instance, the author states in effect: The apex law is the only law favorable to the prospector, under which he can sell his claims. The prospector does not and cannot develop his property in depth; he is too poor; or he has not sufficient skill. The capitalist, or investor, favors the vertical quadrilateral claim, as he knows what he is buying, and what he is not buying. Why need the prospector worry about the vein in depth, seeing that he will never develop it? On the other hand, the capitalist favors the vertical claim. It would appear that the interest of both buyer and seller are identical, and that both are served by the vertical side-line.

SALT BUSH.

Kalgoorlie, W. A., June 26.

Cyanidation in Mexico.

The Editor:

Sir—I have read with much interest the article by F. J. Hobson on 'Cyanidation in Mexico,' which appeared in your issues of August 1 and 8. The extraction of silver from sulphide ore is of special interest to me, as I believe I was the first cyanide chemist sent into Mexico. In 1891 the Mexican Syndicate sent W. H. Trewartha James and myself to Mexico to investigate the field for cyanide work. I had a portable assay-outfit and testing-plant, and did a good deal of work on ores from various parts of the Republic. At that time practically nothing was known as to the treatment of silver ores, and I had no data to guide me. I found that by using a sufficiently strong cyanide solution I got a good extraction on ores containing argentite, and that by using an oxidizing agent with the cyanide, in many cases a very high extraction was obtained. On ores containing antimonious and arsenical minerals the extraction was never good. Owing to ill health I left Mexico in 1892, and did not subsequently have any opportunity of continuing the work on silver-ore treatment. The prospectus of The Mexican Gold & Silver Recovery Co., Ltd., contained my report on the treatment of Mexican ores, in which special stress was laid on the suitability of silver ores to cyanidation, while comparatively little reference was made to gold ores. The Company was floated late in 1892 or early in 1893, but it is only during the last few years that the cyanidation of silver ores has received attention.

The extraction of silver from its antimonious and arsenical sulphide minerals without previous roast-

ing was a difficult problem, and by solving it, Mr. Hobson may claim to have introduced what is practically a new process. In explaining the reactions that take place in the solution of these silver compounds in cyanide in the presence of compounds of mercury, the Mexican metallurgists do not agree with the standard chemical authorities. According to Roscoe and Schorlemmer's 'Treatise on Chemistry,' Vol. 2, page 521, "mercurous sulphide does not exist." Then either Mr. Hobson's equation showing the solution of silver sulphide in his hypothetical mercurous potassic cyanide is incorrect, or the authorities are. Mercuric cyanide is soluble in water, and in this respect differs from the cyanides of the other heavy metals. It is, therefore, not necessary to consider that when a mercuric salt reacts with potassic cyanide, a double cyanide is formed. It can, in fact, be demonstrated that, if potassic cyanide and calomel be made to react according to the equation quoted by Mr. Hobson,

$$4KCy + Hg_2Cl_2 = K_2HgCy_4 + 2KCl + Hg,$$

in presence of oxygen, the reaction proceeds further until all the cyanogen is combined with mercury;

$$4KCy+Hg_2Cl_2+O+H_2O = 2HgCy_2+2KCl+2KOH.$$

The authorities state also that mercurous cyanide does not exist. The decomposition of ferrocyanide by mercuric oxide, or a mercuric salt, is well known as yielding all the cyanogen as mercuric cyanide. Mr. Hobson's discovery that the silver-bearing antimonious and arsenical minerals, stephanite, pyrargyrite, and proustite, are soluble in cyanide solution containing a compound of mercury, and an excess of alkaline hydrate, is of great interest, and will prove of great value in the treatment of these important silver minerals. It is not possible, however, for calcic thio-antimonite, which consists simply of a solution of antimonious sulphide in calcic sulphide, to exist in solution with silver cyanide. The silver would be precipitated as sulphide. I would suggest that the reaction may go along the following lines: the first step in the reaction or series of reactions may be taken as represented by the equation given by Mr. Hobson as to the reaction with stephanite, but I would prefer to state it thus:

$$a\ 2(5Ag_2S+Sb_2S_3)+10HgCy_2+20KCy+4Ca(OH)_2 = 20KAgCy_2+10HgS+Ca_3(SbS_3)_2+Ca(SbO_2)_2+4H_2O$$

It is well known that antimonious sulphide is soluble in alkaline or alkaline-earth hydrate solution forming a soluble thio-antimonite and an antimonite, as given in the equation by Mr. Hobson. In the presence, however, of a compound of a metal, the sulphide of which is insoluble in cyanide solution, for example, lead or mercury, the thio-antimonite is decomposed. The reaction may be stated thus:

$$b\ Ca_3(SbS_3)_2+3HgCy_2 = 3HgS+Sb_2S_3+3CaCy_2.$$

The antimonious sulphide then reacts with some more of the calcic hydrate, again forming thio-antimonite and antimonite, thus:

$$c\ 2Sb_2S_3+4Ca(OH)_2=Ca_3(SbS_3)_2+Ca(SbO_2)_2+4H_2O.$$

The thio-antimonite would then be decomposed as shown by equation *b*, and the series of reactions would proceed until all the antimony existed as antimonite, and all the sulphur as sulphide of a metal insoluble in cyanide. Only after all the antimonious sulphide in solution has been decomposed will the silver go into solution as cyanide. As a highly alkaline solution of antimonite has strongly reducing properties, it is evident it would not be a good solvent of metallic gold, and this emphasizes the difference between the treatment suitable for the extraction of gold and that for silver. Referring to the action of a strongly alkaline solution of cyanide on gold ore, it is well known that the solution of the gold from a sulphide ore is incomplete, owing to the formation of alkaline sulphide in the solution. It is also a fact, though not so generally known, that in the case of a thoroughly oxidized ore, quite free from sulphide, the extraction of the gold is greatly retarded by the use of a strongly alkaline solution of cyanide, such a solution taking three times as long to dissolve the gold as a neutral one or one slightly acid from the presence of HCy. The results given by Mr. Hobson of tests on gold-silver ores containing argentite, proustite, and pyrargyrite can, I think, be accounted for from the reactions of compounds whose existence is well known, and without calling into being compounds such as mercurous sulphide and mercurous potassic cyanide, which are not found to exist under any other conditions.

Stronger proof than the 'negative probability' given by Mr. Hobson will be required before the existence of these compounds will be accepted. Little progress has been made in the development of the technical application of the chemistry of the cyanide process, compared to the mechanical improvement. Most cyanide chemists and managers have little leisure and few appliances for research work. Articles giving the results of original research work on the chemistry of cyanidation are rare, and one like that by Mr. Hobson should be greatly appreciated by the profession.

BERTRAM HUNT.

San Francisco, August 15.

Professional Ethics.

The Editor:

Sir—Of late there has been in the MINING AND SCIENTIFIC PRESS much discussion of professional ethics, and I would like to have opinions on the following points which are puzzling to the young men of the profession. Suppose a young engineer to have been connected with a mining company in a capacity such that he became well informed about the district, and much more so about the company's property. After leaving the employ of this company he is consulted by other parties who are being solicited by his former employers to buy stock in their company. Knowing him to have been employed by the company in question, the prospective investors consult him. Is it proper for the engineer in that case to use the information he possesses in advising his clients? The situation is complicated by the fact that his clients do not intend to invest such a large sum as to make it worth while to have made a thorough new examination, and furthermore, the condi-

tions at the mine remain the same as when the engineer was employed by the company.

Suppose, again, that an engineer's clients have under option a property in a district which the engineer has previously examined, but, being only a prospect, he would have to use his knowledge of other properties, including especially that of his former employers, to render his opinion upon the district, and that this opinion would indirectly condemn the property at which he was formerly engaged?

This is one of the situations with which young engineers are apt to be confronted, and especially those working for small companies. Opinions on these points expressed through your columns would materially influence many.

CONSTANT READER.

San Francisco, August 5.

The Editor:

Sir—The discussion upon professional ethics in the MINING AND SCIENTIFIC PRESS is most interesting, and will surely lead to good results. It seems as if we might be a great deal more rigid in this matter without detriment to the profession. For instance: Is it right to discuss or criticise a brother engineer's report when it is palpably garbled? I speak feelingly, for I have just passed through such an experience. Garbled and incorrect extracts were taken from a report I had made, and these extracts were placed in juxta-position, so as to be entirely misleading, and then sent, without my knowledge or consent, to a number of engineers, who were invited to privately criticise and discuss the subject. Some wrote me about it, others declined to answer directly, and others furnished their ideas.

A courteous public discussion is a good thing, but should we discuss excerpts unless they are made with the author's consent? Even then it may be unfair to the reporting engineer, unless the abstract is not at all modified by the balance of the report. It seems to me that good ethics should make us refrain from answering in such a case.

S. H. BROCKUNIER.

Wheeling, W. Va., August 14.

Ethics of Technical Writing.

The Editor:

Sir—Allow me to submit a few words on the subject of technical writing. It seems to me that if anyone has desirable information which he is willing to publish, such information should be as detailed and as truthful as possible. I have noticed, during the past few months, several articles published in various papers stating that certain mills had been started and had run for a period of, say, six months, during which time the average daily extraction, or the indicated extraction, or the actual extraction (as per bullion produced) amounted to some figure like 93 or 95%. I claim that an article which gives any one such figure, and one only, is misleading, for the reason that the average daily assays, on which is based the indicated extraction, may show 95%, while the actual percentage, as per bullion produced, may be only 70%. I believe that in every case of this kind the indicated extraction and the actual recovery should both be given, and if there be a great discrepancy between the two, some plausible reason should be given, or if an excuse can not be given, the article should be suppressed as being worthless. In cases where, for business reasons, dollars and cents, and questions of profit and loss, can not be entered into, at least all percentages and other data can be given accurately. As I understand it, such an article should be written to give others the benefit of experience gained, to bring out the actual truth instead of concealing it, to allow others to profit by avoiding mistakes that may have been made, as well as to call attention to special improvements and mechanical appliances which have been made use of.

In my experience I know of plants which have been able to show an actual recovery of only 65%, and of others, among them a plant treating 500 tons per day, where the actual extraction, as per bullion recovered, over a period of six months showed more than 100%, yet the work accomplished by these two plants was about on a par, and the widely different results shown were due to improper sampling-facilities in both instances, which could not at the time be remedied. I am always rather suspicious of an article which starts off something like this, after the introductory bow, '100 stamps ran 70,000 stamp-hours; stamp-duty, five tons per stamp; value of heads, $10; value of tailing, $1; extraction, 90%; fineness of bullion, 950; total cost of treatment, $2 per ton,' and so forth. Even figures thus glibly stated in an article generally indicate 'doctoring,' and I claim that anyone who publishes an article should be prepared to answer any question regarding it, and substantiate any statement contained therein.

I would also object to many articles which are written mainly to boom some special process or mechanical appliance. One or two such during the year might be all right, but when you get ten, twenty, or thirty treating of the same thing, it seems to be somewhat of an imposition on the reading public, and would look better to me in the advertising pages, or in a nicely bound catalogue. In regard to the manipulation of some of these modern appliances, one sees too often that the cost of renewals, repairs, and the like are insignificant. My limited experience has shown me that such 'insignificant' costs can generally be figured in cents per ton, so that in the belief that half a truth is little better than a lie, I would insist on explicitness. To carry out the above ideas would probably cause an enlargement of the editor's bump of discrimination to such an extent as to permanently disable him, but it would, in my humble opinion, improve the columns of many of our technical journals.

REZONGADOR.

Guanajuato, Mexico, August 10.

Mexican Mining Law.

The Editor:

Sir—In your leading article entitled 'Mexican Mining Law, published in your issue of August 1, you state: "The Mexican regulation would preclude ownership of mining property by foreign corpora-

tions, and so do the statutes of the United States." On looking over 'Skinner's Mining Manual' I find that many British companies are stated to own mining properties in the United States. The following are three well known English companies operating in different States, and said to own mining properties: Mountain Copper Co., Ltd., operating in California; Stratton's Independence, Ltd., operating in Colorado; and Montana Mining Co., Ltd., operating in Montana. The information contained in 'Skinner's Manual' is supposed to be obtained officially from the companies and from Somerset House, London.

Which statement is correct? Do these foreign companies own any mining property in the United States or not? If not, what do they own?

R. Hay Anderson.

Mexico City, August 14.

[The statement made editorially in our issue of August 1, which our correspondent criticises, referred to the spirit of Federal legislation, which has been distinctly adverse to alien ownership, as manifested by the provision in the mining law which forbids a foreigner to patent a mining claim, and by the statute of 1887, which was amended in 1897 to read, "no alien or person who is not a citizen of the United States, or who has not declared his intention to become a citizen of the United States in the manner provided by law, shall acquire title to or own any land in any of the territories of the United States, except as hereinafter provided; provided that the prohibition of this section shall not apply to cases in which the right to hold or dispose of lands in the United States is secured by existing treaties to citizens or subjects of foreign countries, which rights, so far as they may exist by force of any such treaty, shall continue to exist so long as such treaties are in force, and no longer." The principle of State sovereignty necessitates jurisdiction over property rights, subject, of course, to treaties with foreign powers. Therefore, when a title has once issued the control over it by the Federal Government ceases and it is subject only to the laws of the State in which the property lies. For the most part, the several States admit aliens to buy and hold title to real estate without restriction. The Federal Government has, however, long proved itself sensitive as to foreign ownership of land.—Editor.]

Mining Claims on Forest Reserves.

The Editor:

Sir—In your issue of August 8, in the editorial on 'Mining Claims on Forest Reserves,' the statement is made that the fee simple tenure of real estate has become strongly entrenched in this country. You have enjoyed a wide experience in Mexico, and probably other regions whose laws are inheritances from Spain. I am sure that I speak for a number of your readers in asking that you be kind enough to publish reasons that may be maintained against the adoption of such laws in this country. My understanding is that in Spanish America the title to mines or minerals beneath the surface is lodged in the commonwealth, patents of all descriptions being entirely restricted to the surface.

F. W. Carnahan.

Eileen, California, August 12.

Waters, Meteoric and Magmatic.

The Editor:

Sir—The intensely interesting contributions of Messrs. Spurr, Winchell, Rickard, and Kemp, which have recently appeared in your columns, cannot fail to have caused many readers to compare occurrences which have come under their own notice with the theories advanced. On the one hand, it is hardly to be expected that all those in possession of pertinent data are qualified to express a definite opinion as to the importance of the facts as bearing upon either theory, and upon the other hand, it is probably next to impossible for those to whom the study of the subject is a special care, to formulate sets of conditions which would be acceptable to both sides as being positive evidence, one way or the other. I make the following suggestions with a view to assisting the crystallization of ideas from the magmatic stock of universal knowledge. Let all who are interested in the subject of the genesis of orebodies, out of the store of their own experience, cite one example, with all possible particulars of the conditions associated with the ore occurrence, which in their own opinion is the strongest argument absolutely known to them in favor of either or any theory, but without offering any deductions, each example to be headed simply 'Waters, Meteoric and Magmatic,' and signed. Let these examples be published in your columns. At the end of the specified time let the several examples be referred for criticism as to their bearing, to several authorities to be chosen by the Mining and Scientific Press, as representing as nearly as possible divergent views, and let the full response of such authorities be published. A stimulating discussion should follow and enlightenment would ensue.

Horace G. Nichols.

Ymir, British Columbia, July 10, 1908.

Smelting Charges on Goldfield Ores.

The Editor:

Sir—In reading the article on Goldfield in your issue of July 11 it is stated that the smelter rates on ore assaying up to $50, were reduced to $6 per ton. I am anxious to learn whether the above rate of $6 covers all treatment charges, including insoluble contents; or is the insoluble, amounting to perhaps 60% or more, charged for at the rate of, say, 10c. per unit additional, making the total deduction $12 per ton for treatment charges.

E. Fleming L'Engle.

Los Angeles, California, July 15.

[The rate of $6 per ton covers the entire deduction made by the smelter, under the head of 'treatment charge.'—Editor.]

Asbestos is found in great abundance in the island of Cyprus, in the Mediterranean. It is reported that 1000 tons were mined during 1907.

DREDGING IN THE YUKON.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Frozen ground is generally supposed to be a fatal obstacle to the profitable dredging of gold-bearing gravel; it is usually assumed that all the alluvium of the Far North is in a perpetually frozen condition; in consequence, the opinion obtains even among well informed engineers that dredging in the Yukon is at best a costly experiment. The following data, recently gathered by personal observation, will be of interest to the profession and to others engaged in this branch of mining.

The first dredge to go to work in the Yukon was that of the Lewes River Mining & Dredging Co.* This machine was built to operate on the Cassiar bar of the Lewes river, a tributary of the Yukon, in 1899. In 1901 the dredge was moved to Claim No. 42 Below Discovery on Bonanza creek, and in 1903 up the creek to the Discovery group of claims. Last year the dredge was moved down to No. 6 and 7 Below Discovery, where it is now. On claim No. 42 the work was done on the basis of a 50% 'lay,' that is, the gross output was divided between the claim-holder and the dredging company, but in every other instance this dredge worked on ground belonging to its owners. This machine is now out of date, but it has given excellent service despite hard treatment. It was built by the Risdon Iron Works of San Francisco, and has 3¼ cu. ft. buckets, open-connected, giving a capacity of 900 cu. yd. per day. The screen is 4½ ft. diam, and 17 ft. long. The stacker is of the Risdon type, that is, a bucket-conveyor, which the superintendent, Edward Simpson, says has not given a minute's trouble. For a short stacker of small capacity such as this, the bucket-conveyor is well adapted. The digging-depth reaches to 20 ft., that is, a maximum depth below water of 18 ft. About 4 ft. of bed-rock is removed, up to a maximum of 6 ft., as determined by panning the material brought up by the buckets. The dredge is operated by steam power obtained by burning 3 cords of wood per day, or 85 cords per month. The season averages 160 days. The dredge at the time of my visit was extracting 100 oz. gold, at $15.50 per oz., per day, so that the yield must average $1.70 per cubic yard.

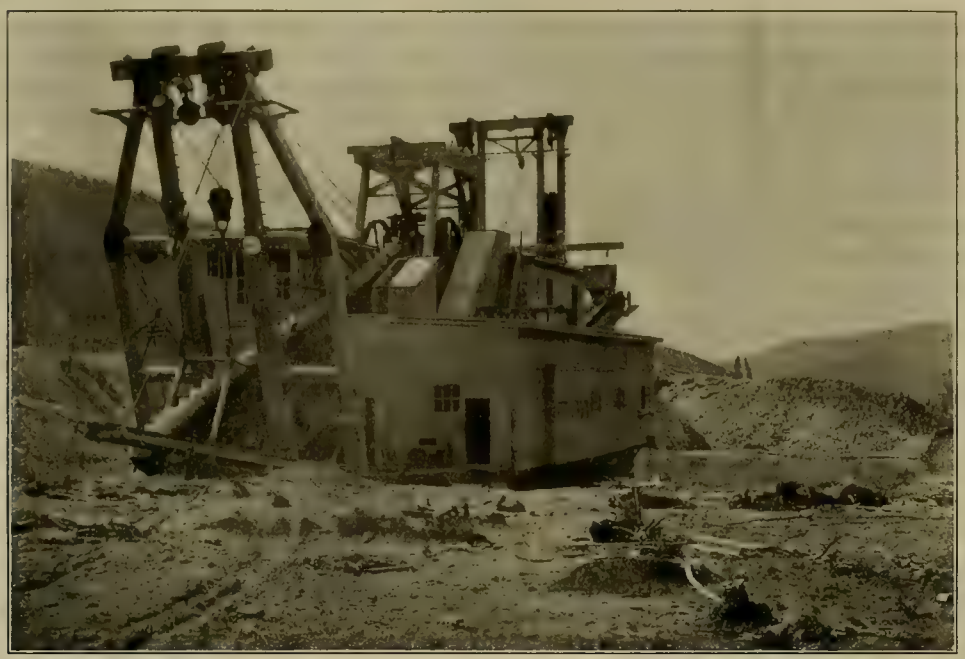
The lips of the buckets are made of tool-steel, oil-tempered, and every other bucket is provided with a tooth such as is attached to a steam-shovel. This tooth is effective in tearing the mica-schist bed-rock, and saves the lips from excessive wear. Quicksilver is used in arresting the gold, the quicksilver being fed to the tables at intervals of 3 hours. The clean-up takes place every 24 hours. Two 12-hr. days are set aside monthly for repairs.

The ground is thawed artificially ahead of the dredge. It has been ascertained that the ground will keep warm for a month, so it pays to keep the thawing at least that much ahead of the digging. In any part of the creek that has been previously worked, as by drifts, accumulations of ice are found, due to seepage of water into voids and the effect of the ground-ice. In gravel that has not been molested the conditions are more favorable, for there the seasonal thaw will conquer the frost, if once the covering of moss be removed. Mr. Simpson informed me that it is necessary to thaw artificially all the ground to be dredged, for an encounter with a pillar of ice will rack the dredge more than a month of ordinary work. "It is like putting the dredge against so much granite." The thawing was in progress just in front of the dredge, the steam-points being distributed at intervals of 4 by 8 ft. As the season progresses the interval is increased; at first, in April, it was 4 by 4 ft., and this was widened until by June 20, it had become 8 ft. one way and 4 ft. the other. On July 17, the day of our visit, the seasonal thaw had softened the ground down to 7 ft., so that the points had that much less to do. The cost averages 12c. per cu. yd. In virgin ground an interval of 24 ft. for the points would be effective, but it does not pay to take chances wherever there are old workings, for the frozen pillars, topped by patches of moss, constitute the best of the gravel, and in old workings there is an agglomeration of gravel and 'muck,' with ice, making it imperative to thaw the whole mass. It is poor economy to take chances, for not only does the frozen ground imperil the dredge, but it prevents extraction of the gold. In virgin ground, after stripping the moss and mould, the natural thaw would reach to 14 ft. at the end of two seasons. This dredge has extracted about $700,000 in its various applications. By a life of seven years, that is, seven short seasons, and a probable further usefulness to the end of next summer, it has demonstrated what good service even one of the older and smaller machines will give under adverse conditions.

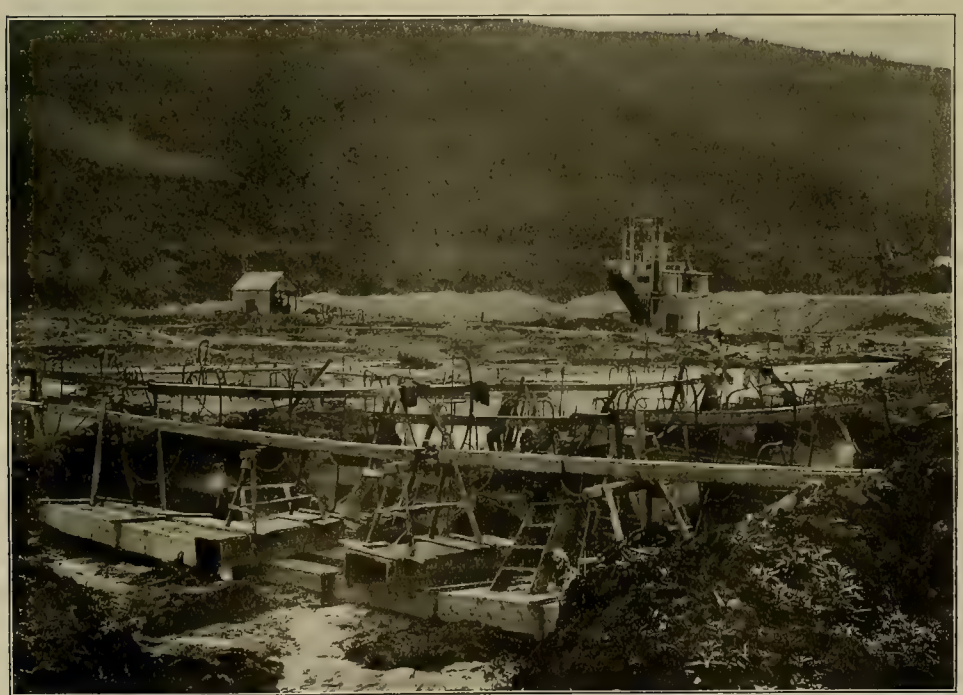
The Canadian Klondike Co. commenced work on the Boyle Concession three years ago, and began dredging in August 1905. This boat, built by the Marion Steam Shovel Co., has done most satisfactory work, considering that it was designed in 1904, since which date much has been learned concerning details of dredge construction. It is interesting to state that this dredge in the valley of the Klondike river is practically a counterpart of the 'California No. 3,' at Oroville, operated by the Oroville Dredging Co., although strengthened in parts, and with a better screen-arrangement. The record of the dredge on the Klondike is fully as good as that working under the supposedly more favorable conditions in California. In 1906, from May 9 to October 23, this dredge handled an average of 2935 cu. yd. per day; in 1907, from May 15 to October 9, this dredge dug 3490 cu. yd. per day. It is known that a good profit was made in both these seasons.

This dredge is the only one at work on the Boyle Concession, a tract covering 40 square miles, and extending for 6¼ miles along the Klondike, so as to cover from half a mile to one mile wide of alluvium. The gravel is 22 to 35 ft. deep, and bed-rock is soft schist, so that the buckets dig into it to

*At the present time there are 17 dredges at work in the Yukon Territory.



Dredge No. 6 of the Yukon Gold Company, on Bonanza Creek, Yukon Territory, Canada.



Dredge No. 6. Boiler Plant and Thawing Apparatus on Claim No. 90 Below Discovery, Bonanza Creek, Yukon Territory.

a depth of 4 ft. No artificial thawing-methods are employed, the ground having been softened by the successive seasonal thaws, following the removal of the overburden of moss by freshets sweeping across the flat valley. A little frozen ground was struck near the edge of the channel, without damage to the dredge, and without benefit to the clean-up; the buckets cut into it and excavated it successfully, but the fragments of frozen gravel were not disintegrated in the screen, passing onto the tailing-pile without the extraction of any gold that they might have contained. With the exception of this incident the frozen ground, which is such a bugaboo to dredge-masters in the North, has played no part in the record of this particular dredge.

It remains to add that the buckets are each of 7 cu. ft. capacity, close-connected, so that the machine handles 3900 to 4000 cu. yd. per day. Power is applied through the medium of electricity, generated by a 400-kw. Westinghouse generator, making 3600 revolutions per minute direct-connected to a Parson's steam-turbine. Wood at $7.75 per cord is burned in water-tube boilers, supplying steam at 165 lb. pressure. No quicksilver is used on the boat. The gold is arrested by riffles made of expanded metal stretched upon cocoa-nut matting, which in turn lies on canvas. This arrangement reaches for 44 in., and is followed by 8 ft. of angle-iron riffles, to which is added a tail-sluice with more riffles. Of the total extraction, 97% is effected the 4 ft. of expanded metal and matting. When a clean-up is to be made, the expanded metal is lifted, the matting is rolled in the canvas, to be carried to the clean-up room, at some distance from the dredge and near the office. Here the matting is washed in a tub, the residue is panned, and the gold collected for melting into bars, while the reject is fed into a grinding-pan to which quicksilver is added. The gold is coarse; after melting, it is 745 to 755 fine, and is worth $14.50 per oz., deducting the Government royalty, or export tax, of 37½c. per ounce. It may be mentioned that this dredge was started in ground which had been partly worked by an unsystematic combination of steam-shovel, dump-cars, washing-plant, and finally steam-scrapers to move the tailing, this complex operation resulting in a loss on gravel averaging $2 per cubic yard, while the dredge is reputed to have earned handsome profits in the same ground.

The Yukon Gold Co. will have seven dredges in operation before the close of the present season. The three dredges first built had buckets of 5 cu. ft. capacity. The four new dredges, of which two are completed, and two are nearly finished, have buckets of 7 cu. ft. capacity, and they have been designed to fit local conditions. On July 15 I visited one of these larger dredges, namely, that known as No. 6, on Bonanza creek, at 90 Below Discovery. All claims are numbered from the Discovery claim, up or down the creek. In the Yukon Territory each full claim extends for 500 ft.; the number multiplied by 500 gives roughly (for fractions intervening) the distance from the place where gold was first found on that particular creek. Dredge No. 6 of the Yukon Gold Co. is an up-to-date machine of the most approved design and built by the Bucyrus Co., of South Milwaukee. Going aboard the dredge, it is noted that the buckets have lugs designed to transmit the digging-stress from the lips to the base, and to relieve the rivets from excessive strain. Mr. E. E. McCarthy, the dredge superintendent, informed me that the lips of the buckets were made of Manard manganese steel, the base of chrome-nickel steel, and the hood of cast-steel. Each bucket has a capacity of 7 cu. ft., and as the speed over the tumbler is at the rate of 23 buckets per minute, the capacity of the dredge is from 90,000 to 125,000 cu. yd. per month, depending upon conditions. These conditions include, more particularly, the depth of the gravel, the character of the deposit, and the amount of bed-rock excavated.

The lower tumbler is circular, instead of having the more usual lugs or ears; it completely fills the space between the lower castings of the ladder, so as to prevent the crushing of gravel that might otherwise fall between the ladder and the tumbler. This tumbler has also a through tie-rod, which may be removed without removing the lower journals. The ladder itself is of most recent design, with a through-sluice arrangement; this takes all the spill from the buckets to the lower end of the ladder, discharging it into the pond for re-handling by the buckets. The rollers are made of chilled-iron and manganese-steel; they are of 14-in. diam., fitted with 3½-in. shaft and self-aligning bearings. The ladder has double suspension, which distributes the load. The bow-gantry is of 4-post trussed design, as shown in the accompanying photograph. By this design a portion of the strain created by the digging is transmitted to the outside of the hull near the centre of pressure, thereby preventing the warping of the bow-pontoon. A new style of fair-lead sheaves on the bow lines is calculated to lessen the wear on the ropes when feeding across the cut. The ropes are of ⅞-in. steel. The pair of main gear-wheels actuating the upper tumbler are 12 ft. diam. The tumbler-shaft is 16 in. within the tumbler and 14 in. within the driving wheel. All the gear of the upper tumbler-drive is cut-gear; the shafting is made exceptionally heavy, the intermediate shaft being 8 in. diam., so as to resist severe strains. Both the intermediate shaft and the tumbler-caps are securely anchored, in order to withstand the upward thrust.

The buckets discharge into a hopper having a bottom made of gravel resting at a natural angle, so that wear of iron is obviated. In the older designs the gravel fell down a chute, the lining of which had to be replaced at intervals. The revolving screen, which sizes the gravel so that the coarse goes over the end of the boat while the fine undergoes further treatment, is 6 ft. diam. and 28 ft. long; it weighs 6 tons and makes 9 revolutions per minute. The frame of the screen consists of castings and angle-irons, to which perforated plates of ⅝-in. steel are fastened. The upper part of the screen has ⅜-in. tapered holes, and the lower end has 1

by 2 in. slots. Angle-irons are placed within the screen, transversely, so as to impede the flow of gravel and cause thorough washing. When worn, the screen-plates can be patched. The periphery is subdivided into 6 pieces and the length of the screen into 5 divisions. The plates will wear for 8 months, the segments being interchanged so as to equalize wear. This result is also obtained by reversing the revolution of the apparatus during the next season. The screen has a slope of 1½ in. per foot. From the screen, the small gravel falls into a 'distributor,' so as to equalize the quantity of material descending upon each of the 14 tables on which the gold is arrested. This distributor may be described as a hopper-trough in step-like subdivisions, each of which has a door through which the gravel is admitted to the tables. By this arrangement it is possible to regulate the feed on each table. A water-pipe traverses the screen lengthwise inside, to spray the gravel; and there is another pipe outside to supply the tables with additional water.

These tables, of which there are seven on each side, are wooden frames crossed by so-called 'Hungarian riffles,' these being merely strips of wood covered by ⅛ in. iron, 1⅛ in. wide. The iron tops slope in a direction opposed to the flow of the gravel, and overhang on the opposite side, so as to form an eddy. The distance between the riffles depends upon the grade; here it is 1¼ in., with a grade of 1½ in. per foot. Cocoa-nut matting and canvas are being tried under the uppermost riffles. The tables are 3 ft. wide and 16 ft. long. They discharge into sluices running lengthwise with the dredge, and extending over the stern.

The riffles are held in place by longitudinal strips and wedges. By knocking out the wedges, the riffles are removed and the sand shoveled into a box, from which it is fed through a bath of quicksilver and thence into a small box fitted with riffles and traps. The amalgam is retorted in the usual way. Quicksilver is fed by hand to the head of each table. This is done by scattering the contents of a bottle containing 8 lb., the operation being performed by the man in charge of the clean-up apparatus. Gold is visible on the tables, and the addition of quicksilver is regulated thereby. As much as 50 lb. per day may be used. Three flasks are held on the boat for this purpose, each flask containing 76½ lb. The clean-up is made as often as the riffles become choked, usually at intervals of two days. In order to arrest gold in the spill from the buckets, a supplementary system of tables (called the 'save-all') is provided in the well of the dredge. It consists of a steel grating, similar to an 'under-current,' discharging into a series of zig-zag sluices, with riffles, supplied with extra water. The stacker consists of a trussed girder carrying a Robins belt-conveyor, the belt being 34 in. wide, moving upon troughing-idlers made of three pieces, so as to give excellent service. The return idlers are in one piece.

The nominal horse-power consumed on the dredge is 260, but it varies up to 15% overload when operating under adverse conditions of digging, and when running smoothly the consumption of power is much less than the nominal. In default of meters, no exact measurements are available. For the digging, a type F Westinghouse 100 hp. variable-speed motor is used. The starboard winch, which operates the lines governing the movements of the dredge, is a type F 20 hp. variable-speed motor. The pumps are 10 in. and 8 in. Worthington make, under 50 and 35 ft. head, respectively, both direct-connected to a 75-hp. type CCL constant-speed motor. The screen is revolved by a 20-hp. motor of the same kind, through a counter-shaft to gears. The Robins conveyor on the stacker is operated by a 30-hp. motor, also of the CCL type. The CCL motors have proved less satisfactory than the older type C made by the same electrical company. Three transformers, of 100 kw. each, step the electric current down from 4000 to 440 volts. The transformers are on the boat itself and are so piped and connected that in case of fire the oil will escape under water; they are set in pans, with an outlet in the water.

The hull is strongly constructed, with two overhead trusses extending the whole length of the boat, which also has a transverse truss at the centre to take the heavy strains on the tumbler-gantry. The hull is 38½ ft. wide, 98 ft. long, and 9 ft. deep. The lumber came from Vancouver. The total weight of the boat is 800 tons. Most of the movements of the boat are controlled by one man stationed in the winch-room. The digging, or port-winch is of standard Bucyrus type, with Medart friction-clutches, specially made of cast-steel. The stacker is raised by an independent winch, which is actuated from the counter-shaft of the screen-drive. The screen, stacker, and pumps are not controlled from the winch-room. One man on deck looks after the oiling and running of the machinery. On shore, one man attends to the placing of anchors or 'dead-men' and the arrangement of the shore-lines. Two men are necessary for this work when the ground is shallow and the boat is advancing rapidly. Every part of the dredge is of the most approved construction, for the length of the season in the Yukon country is so short as to make experiments inadvisable. The choice of design is the outcome of wide experience in this branch of mining on the part of O. B. Perry, the general manager of the Yukon Gold Co., and it represents the best type of machine now at work in the North.

(To be Continued.)

The world's mineral production for 1906 reached the stupendous quantity of 1,236,000,000 tons, according to the approximate figures now available, although the final statistics will probably show a greater amount. Of this almost unimaginable quantity, 1,100,000,000 tons was coal, which is an increase of 79,400,000 tons over the previous year. To this increase the United States contributed the largest amount (21,000,000 tons), with Germany a close second, and Great Britain third. The United States produced during 1906 more than 413,000,000 tons of coal, being at the rate of over 1,000,000 tons per day for the year. The value of the world's coal production was more than four times that of all gold mined.

CYANIDATION OF SILVER ORE IN MEXICO.

By W. A. Caldecott.

*In replying to the discussion upon my paper, I may point out that the methods therein described apply to ores carrying both arsenic and antimony as well as silver sulphide, but that the concentration referred to doubtless separates a large proportion of these base-metal compounds. Since the chemistry of silver cyaniding is a problem so complex and so little investigated, I may venture to express the hope that the Proceedings of the Society will ere long be enriched by a discussion of the subject from the standpoint of modern science and experiment.

S. H. Pearce's remarks are of peculiar interest from an historical aspect, as evidencing the close relationship between Rand and Mexican practice. Many features of the old Rand Central Ore Reduction Co.'s plants, such as mechanical stirring gear, are much in evidence in Mexico today, and have a common origin, in the views of Chas. Butters and the large staff, including J. Johnson and E. M. Hamilton, whom he took with him from these fields. Mr. Pearce's early suggestion to employ lead salts has certainly become common practice in Mexico since his visit in 1904, but without discussing the extremely nice point as to the relative solubility of the two remarkably insoluble bodies, lead sulphide and mercurous sulphide, I can hardly accept the lead sulphate hypothesis. Lead sulphate readily dissolves in excess of caustic alkali, and conversely addition of a soluble sulphate to an alkaline plumbite solution does not produce a precipitate. The suggestion in the paper that the oxide of lead exists in solution as an alkaline plumbite, or as part of the acid radical, explains the above experimental observations.

It is gratifying that Dr. Moir's mathematical examination, from the standpoint of the ionic theory, of the experimental figures quoted in the paper, has not revealed any serious discrepancies, and his contribution confirms and extends the general conclusions expressed. His theoretical deduction that excess of alkali is detrimental to the dissolution of the silver, by causing the existence in solution of Na_2S instead of NaSH, is not borne out by the results quoted in the paper, but the tests given later indicate a prejudicial effect of alkali which may be ascribed to its solvent action on mineral sulphides in the ore.

Since the original paper was written I have had various tests carried out on a mixture of oxidized and pyritic Mexican gold-silver ores from the El Oro, Pachuca, and Guanajuato districts. The analysis of the mixed ore is as follows:

	Per cent.
Silica (SiO_2)	77.89
Metallic iron (Fe)	0.65
Ferric oxide (Fe_2O_3)	3.39
Alumina (Al_2O_3)	5.73
Lime (CaO)	5.52
Magnesia (MgO)	1.33
Sulphur (S)	1.61
Carbonic acid (CO_2)	1.97
Water (loss on ignition)	2.02
	100.11

The ore assayed 16.3 dwt. gold per 2000-lb. ton, equal to 27.9 gm. per metric ton, and 490 dwt. silver per 2000-lb. ton, equal to 840 gm. per metric ton.† The metallic iron shown in the above analysis was separated as such by the magnet, and was no doubt introduced during fine-crushing on the iron bucking-board. Part of the iron reported as oxide was probably combined with sulphur as pyrites. All experiments were made on ore dry-crushed through a 200-mesh screen. Hence the crushed ore was practically slime, from a metallurgical standpoint. By long boiling, first in strong nitric acid, and then, after washing, in aqua regia, an extraction of 93% of the gold and 91.4% of the silver was obtained. Such a treatment would of course dissolve any base-metal compounds, as well as the gold and silver, which the preliminary fine-crushing had exposed to the action of these powerful solvents. To test the possibility, indicated in the paper, of re-precipitation by soluble sulphides derived from the ore of the metals in solution, the following experiment was made: 100 gm. of the the above finely crushed ore was mixed with 200 c.c. of sodium cyanide solution of 0.05% strength (expressed in terms of potassium cyanide) and 1 gm. of lime, and the mixture shaken at intervals of six hours. The pulp was then halved into (a) and (b). The half (a) had the solution, which contained free cyanide, at once filtered off and assayed. The half (b) was put aside in a small closed flask, which it almost completely filled, for six weeks, and was shaken once weekly; at the end of this time the solution, which then contained no free cyanide, was filtered off and assayed. The results were as follows:

	GOLD — Dissolved —			SILVER — Dissolved —		
	Dwt. per 2000-lb. ton.	Gm. per metric ton.	Extraction %	Dwt. per 2000-lb. ton.	Gm. per metric ton.	Extraction %
(a) Six hours..	10.00	17.1	61.3	155	266	31.6
(b) Six weeks.	0.50	0.9	3.0	21	36	4.3

This showed that serious re-precipitation takes place under these extreme conditions, involving destruction of all free cyanide present; but a similar test with 0.25% solution showed practically no re-precipitation after 66 hours' contact, when the residual free cyanide strength was 0.21%. The possibility, however, of re-precipitation under certain conditions may serve to explain why such short and imperfect settlement in the decantation process of slime-treatment is practiced in Mexico, if experience there has shown that prolonged and undisturbed contact between slime and solution results at times in higher residual value in the tailing resulting from re-precipitation. Tests of a week's contact of ore submerged in cyanide solution, and shaken only once daily, gave poor results, so that favorable conditions, rather than prolonged treatment, seem to be the essential requisite. In general, there would appear to exist the opposing influences of solution, aided by the aeration due to agitation, and of precipitation of dissolved gold and silver favored by absence of oxygen and destruction of free cyanide. A similar condition has been noted in regard to gold precipitated on zinc shavings in contact with cyanide

*Read before Chem. Met. & Min. Soc. of South Africa, July, 1908, in conclusion of discussion.

†One gram per metric ton is equal to seven-twelfths of a pennyweight per 2000-lb. ton.

solution. The practical conclusion appears to be that separation of solution from solids should be prompt after the gold and silver is dissolved.

The following tabular statement illustrates the results of one series of experiments among others, carried out on the above ore, crushed through 200-mesh, and mixed with 77% of its weight of precipitated silica, on account of the limited quantity of material available. The results are the averages of duplicate tests, which consisted, except where otherwise stated, in agitating by hand at ordinary temperatures 65 gm. of the mixture with 130 c.c. of a solution of sodium cyanide 0.25% strength (expressed in terms of KCy) in 800 c.c. closed vessels for six hours, together with the percentage stated in the table on the weight of the ore of the re-agents mentioned. The time of treatment was purposely limited so as to exhibit the difference in rate of dissolving, as otherwise given sufficient time the less favorable treatment might equal the more favorable in the final result. The mixed and diluted ore thus experimented on had a value of 9.2 dwt. gold per 2000-lb. ton, equal to 15.8 gm. per metric ton, and 277 dwt. silver per 2000-lb. ton, equal to 475 gm. per metric ton. In (e) 0.5% solution was used, of which nearly half had been converted into HCy by titration with HCl beforehand. In (h) and (j) the lead salt had been dissolved in a minimum of caustic soda before being added to the ore. After agitation in each case had been completed, the solution was at once filtered off, and the calculations are based on its gold and silver content, rather than on the residue, which might have decreased in value during the aeration consequent on thorough washing. Considerable free cyanide was present in the solution after treatment in each instance. The accompanying tables show the results.

GOLD.

Treatment and re-agents.	Dissolved per ton of ore. Dwt. per 2000-lb. ton.	Gm. per metric ton.	Extraction, %.
(a) NaCy sol. + 0.1% BaO_2 + 1% CaO	8.25	14.1	89.7
(b) NaCy sol. + oxygen (at 100 lb. pressure) + 1% CaO	8.20	14.0	89.1
(c) NaCy sol. at 58°F. + 1% CaO	7.65	13.1	83.1
(d) NaCy sol. at 100°F. + 1% CaO	7.60	13.0	82.6
(e) NaCy sol. + HCy sol	7.15	12.2	77.7
(f) NaCy sol. + 0.1% PbO_2 + 1% CaO	6.75	11.5	73.3
(g) NaCy sol. + 0.11% PbO_2H_2	6.75	11.5	73.3
(h) NaCy sol. + 0.1% PbO_2, xNa_2O + 1% CaO	6.35	10.9	69.0
(i) NaCy sol. + 0.11% PbO_2H_2 + 1% CaO	5.35	9.2	58.1
(j) NaCy sol. + 0.1% PbO, xNa_2O + 1% CaO	4.50	7.7	49.0

SILVER.

Treatment and re-agents.	Dissolved per ton of ore. Dwt. per 2000-lb. ton.	Gm. per metric ton.	Extraction, %.
(b) NaCy sol. + oxygen (at 100 lb. pressure) + 1% CaO	220	377	79.4
(d) NaCy sol. at 100°F. + 1% CaO	215	369	77.6
(a) NaCy sol. + 0.1% BaO_2 + 1% CaO	215	369	77.6
(i) NaCy sol. + 0.11% PbO_2H_2 + 1% CaO	195	334	70.4
(h) NaCy sol. + 0.1% PbO_2, xNa_2O + 1% CaO	185	317	66.8
(c) NaCy sol. at 58°F. + 1% CaO	180	308	64.9
(f) NaCy sol. + 0.1% PbO_2 + 1% CaO	170	291	61.3
(j) NaCy sol. + 0.1% PbO, xNa_2O + 1% CaO	145	249	52.3
(g) NaCy sol. + 0.11% PbO_2H_2	140	240	50.5
(e) NaCy sol. + HCy sol	110	188	39.7

In studying these it at once becomes apparent that the percentage extraction of the gold is usually better than that of the silver, but that a satisfactory gold result by no means implies an equally good silver extraction. In other words the same factors affect the two metals differently. In general, the chief influence favoring ready solution of the gold is oxygen in some form, and the results are better according as this element is amply provided, or worse as substances are formed which consume it. The two highest extractions (see *a* and *b*) are due to the oxidizer BaO_2 or to compressed oxygen. Variation in temperature (see *c* and *d*) shows little difference, possibly due to the alkaline CaO in the warmer solution dissolving more oxygen, absorbing sulphides, and thus counteracting any tendency of the gold to dissolve faster. The presence of HCy (see *e*) gives somewhat poorer results, which may be attributed to the presence of some gold alloyed with silver in the ore, and the slow rate of dissolving of the silver, retarding the solution of the gold. The trials with lead salts all show poorer results than the foregoing. PbO_2 with caustic soda is worse than without (see *h* and *f*), and similarly in the case of PbO (see *j* and *i*). This may be attributed to the caustic alkali dissolving and reducing sulphides from the ore. The available oxygen in PbO_2 causes, however, better results than the use of PbO (compare *f* and *h* with *i* and *j*); PbO without lime (g) is better than with lime (i); here also the solvent effect of free alkali on mineral sulphides may be accountable. The amount of lead available was in every case small as compared with the sulphur in the ore, but the generally poor effect of lead is difficult to explain, except possibly on the grounds that the PbS which formed absorbed oxygen more readily than a corresponding amount of Na_2S in solution. The dissolution of silver is not only more imperfect than that of the gold, but is also more readily affected by varying factors. While accelerated by warmth and oxidizers, it is retarded, on the grounds detailed in the paper, both by the presence of soluble sulphides, and even more of hydrocyanic acid. The last is strikingly evident in the two lowest results (see *g* and *e*), where HCy is present in the solution, either through the addition of HCl beforehand, or through the effect of latent acid in the ore in the absence of protective alkali. While aurocyanhydric acid ($HAuCy_2$) is relatively soluble, I am not aware that the corresponding silver compound exists at all. Hence the presence of some

alkali appears advisable, and in any case its injurious effect is not so apparent as with gold.

The above results do not exhibit the benefit from the use of lead salts which might be anticipated from theory, so far as it is developed, and from their common use in Mexican practice. The reason is obscure, although the amount of lead salt used was much less than the sulphur-equivalent in the ore, and it is possible that some unrecognized feature of the ore experimented on, or of the tests employed, differed materially from usual working conditions. It is possible that the development of the use of warm cyanide solutions in South Africa, recently discussed in reference to accelerated slime-settlement by A. Salkinson, may be advantageously paralleled in silver ore treatment in Mexico, although the extensive use of electric power there does not provide a cheap source of heat in the shape of exhaust-steam. To carry the effect of heat to an extreme, some of the same fine-crushed ore was boiled with twice its weight of 0.26% cyanide solution and 0.1% lime for six hours in an open beaker, water being added periodically to maintain a constant volume. This resulted in 90% of the free cyanide being decomposed, and only 28.3% of the gold and 32.6% of the silver being dissolved.

The foregoing experiments, however, leave much to be elucidated in reference to the precise influence, especially upon silver extraction under working conditions, of the following factors: (a) time of treatment, (b) temperature, (c) strength and volume of solution, (d) oxidizing agents and aeration by agitation, (e) lead salts, (f) presence of free alkali, or hydrocyanic acid, and (g) re-precipitation of the gold and silver. While in Mexico the mechanical features of fine-crushing, agitation, and filtering of slime have been skilfully and profitably developed, the actual percentage-recovery by cyaniding, and its cost, still afford scope for improvement,* and there is little doubt that intelligent and systematic research from a chemical standpoint along the above lines would be as well repaid as it would be full of interest. In concluding this reply I may confess that the tentative views and speculations therein advanced are necessarily based on experiments upon material which was unfortunately limited in amount, and without the great advantage of constant contact and long acquaintance with working-conditions and observations. Moreover, in the vast mining area of Mexico, so diverse and complex are the ores, that generalizations are much restricted, and special conditions and problems have to be dealt with in each district and plant. Hence, while those with greater knowledge of the subject will doubtless properly dissent from some of the views expressed, I trust that a sufficient residuum of correct deductions may remain to justify this addition to the small amount of published literature upon the subject.

Babbitt metal was invented by Isaac Babbitt, in 1839, at Taunton, Massachusetts.

*For instance, the official report of the Guanajuato Mining & Milling Co. for 1907 gives the cost of cyaniding at 7s. 7½d. per ton, with an average residue worth 6s. 2d. in silver and gold, equal to an extraction of 68.97% from sand and 70.37% from slime. See MINING AND SCIENTIFIC PRESS, May 30, 1908, p. 750.

METAMORPHIC RANGES IN SONORA, MEXICO.

Written for the MINING AND SCIENTIFIC PRESS
By F. J. H. MERRILL.

While the mountains of Sonora, as a rule, consist wholly or in part of volcanic rocks, there are some metamorphic ranges which present a special type of mineralization, and deserve a brief description. Two observed by me are in the northern part of the State. One, on the boundary between Urés and Altar, about fifteen miles west of Puerto Station, is known as the Sierra del Maiz and consists of semi-crystalline limestone and mica schist. These altered sedimentaries are heavily injected with igneous rock in the form of dikes and bosses. Rhyolites and andesites are most prominent among these, but a coarsely crystalline rock, having the appearance of a diorite also occurs in small domes and bosses. This range has a length of twelve or fifteen miles, and separates part of the watershed of the Sonora river from that of the Magdalena. Another metamorphic range, called the Sierra Jojova, lies west of the Magdalena river and extends from the latitude of the city of Magdalena some thirty miles northward, till it unites with the range known as the Sierra Guacomea. The Jojova range is composed mainly of a very fine-grained mica schist, which, under the stress of mountain-making forces, has been extensively shattered by joints which traverse it in many directions. This schist is everywhere cut by pegmatite dikes, varying from 6 in. to 3 or 4 ft. in width and extending for considerable distances.

The metallization of this metamorphic range is not abundant, and, where I have made a study of it, is wholly in the form of impregnated or metallized shear-zones. A prominent example is that of the Sonora Bonanza, a mining property about four miles west of Imuris. There, in a shear-zone extending over a mile in length, is an orebody containing gold, silver, copper, and molybdenum, the latter in the form of wulfenite. A noteworthy circumstance is the occurrence, at a few points on the shear-zone, of sufficient quartz to give the semblance of a true vein-outcrop. Development shows, however, that these quartz masses are local deposits, and do not represent a continuous vein, although there is ore in the shear-zone below the quartz.

On the west side of this range near the Babinioqui ranch, are some small copper prospects. Here pegmatite dikes have been shattered along their length by shear-zones, and the fragments saturated with copper minerals, now altered to silicate and carbonate. Another mine in this range is the Jojova, which I have not yet been able to visit. Cerro de Plata is the name of still another mine to the northward. The northeastward continuation of this range is known by the name of Sierra Guacomea and contains some mining properties, but I have not yet had an opportunity to study its geology or its metallization.

Australia produced 3,180,940 fine ounces of gold during 1907, having a value of £13,511,766. During the same year the mines of the Transvaal produced 6,451,384 oz., valued at £27,403,738.

MINERAL PROSPECTS AROUND DEATH VALLEY.

Written for the MINING AND SCIENTIFIC PRESS
By ROBERT E. RINEHART.

Mining activity in the vicinity of Death Valley, which in the heydey of the Greenwater and Skidoo excitements was booming, has sunk back to the dead-level of the lonesome days following the farewell of the twenty-mule borax teams. The inhospitable region is practically abandoned to chuck-a-walla, side-winders, and a few burro-men camping about the canyon springs and desert wells. The panic of October bore down on Death Valley and cast a gloom that has not lifted. There is not a 'wild-cat' mewing loud enough to be heard above the desert stillness. Veterans living on the scant bounty of grub-stakers are reduced to half-rations or are going to work at the Lila C., the prize mine of the Pacific Coast Borax Co. Nothing can do justice to the depression except the dirge of the lone store-keeper at Stove Pipe Well. This collapse of Death Valley mining would not be worthy of much consideration did it not mark the exhaustion of the most fertile field in America for mining fairy-tales. For a good half-century the mysterious hidden riches of Death Valley have been used to lure grub-stakes from men easy with their money. In more recent years they have been the capital of many a million-dollar capitalization. Has anyone ever attempted to compute the money spent in the quest of the rich silver lode of Bennett's Gunsight Lead or the wonderful gold butte of crazy Breyfogle? If he has, let him write it down to the debit side of Death Valley's account. Rash desert rats used to find even the Peg Leg mine as far north as Death Valley and dispose of it to simple strangers from the settlements. The region has been a bonanza for desert tramps. But the valley's age of mystery has come to a close. With motor cars honking across the salt-marsh and the Tonopah & Tidewater Railroad on its fringe, Death Valley has shut the book of its romance and is now looking forward to actual operation in mining.

Upper End of Death Valley.

What the region will amount to in future is largely a matter of conjecture. Some regard the surrounding mountains as a land of promise; others consider prospecting in the Panamint and Funeral ranges a waste of time. Many old prospectors assert that the hills have been 'raked for ledges with a fine-tooth comb', while others are equally certain that the ground has no more than been scratched over. This much, however, can be taken as sure—the days of fake mining are gone.

Mt. Blanco, the Largest Borate Deposit in the World.

From the time when pioneer desert-men came into the valley hunting the Gunsight Lead, until the discovery of Tonopah, the Panamints have been alive with prospectors. Plenty of water is found on the Telescope side of the valley in most any canyon. Snow stays the year round in the gullies of Telescope peak, yielding excellent drinking water to the

foothills below. Consequently the locality has always swarmed with 'desert-rats.' Moreover, during the years of the rush caused by the discovery at Surprise canyon, and for many years after, the Panamints came in for careful scrutiny. Funeral range likewise, as far up as the Grapevines, has been thoroughly ransacked. This range contains many borax deposits. In fact, it is the field from which the Pacific Coast Borax Co. plans to draw its supplies in future. Practically all the mounds and foothills of Furnace Creek 'wash' are now the property of that company. To secure these borax deposits the company for the last twenty years has had experts scouring Funeral range. Its hills have been tramped over by every sort of prospector. It is pretty good reasoning to infer that, were there any gold, silver, or copper deposits worth while in Funeral range, these scouts would have encountered some of them. As a matter of fact, the Pacific Coast Borax Co. does not own a gold, silver, or copper property anywhere in the vicinity of Death Valley.

This criticism does not hold good of the north end of Death Valley, which is sometimes variously called

Amargosa Canyon.

Lost valley and Mesquite valley. The mountain ranges that wall in this hollow of desolate sand-dunes have never been disturbed to any extent by ore-hunters, because water-holes and springs are few and far apart, and a base of supplies has to be set far away. Thus only flying trips have been possible into this district. The Tin mountains, along the west side of Lost valley, are perhaps the least explored desert mountains in this country. The upper end of the Grapevines, the east rampart of Lost valley, though much better known than the Tin mountains, will bear more careful prospecting. This is the reputed location of the Breyfogle butte. On the side favoring further prospecting around Death Valley it should be said that the prospectors have previously been the laziest lode-hunters in the desert. Much of the alleged prospecting has been done by 'desert-rats', those half-mad desert tramps who never made more than a pretense of looking for ore. Their search was generally confined to trails between water-holes. It is significant that the real prospector of Death Valley is ferreting for ore down in the Panamints. He is Johnny Seity, or 'Cyty', or 'Cytee'. 'Death Valley Scotty' will give a gold mine to anyone who can figure out the correct spelling of the patronym of the wizened Austrian prospector who is familiarly known about Death Valley as 'Johnny-behind-the-Gat,' which is short for 'Johnny-behind-the-Gatling-gun', a sobriquet bestowed out of respect for the prospector's Mauser automatic combination pistol and carbine. Seity prospects. After he has been over a hill and left it, one can with easy conscience pass that hill. When necessary to examine a ledge the little Austrian will go up a canyon wall which any mountain sheep with an ounce of caution would avoid. As a result, Johnny has made three good strikes in his life, a fine record for any prospector's career. His last discovery was the Big Belle, a property in the Grapevines, which looks rich. Johnny has been 'promoted' entirely out of the Big Belle. For that reason he is down in the Panamints looking for another. His presence is considered a good recommendation for the Panamints as prospecting ground.

Death Valley has one actual mine with which to begin its new era. It is the Keane Wonder, a wonder if for no other reason that that it is the only producing property of the region. While not a bonanza, it is paying. Forty miners are busy supplying $20 ore for a 20-stamp mill. Now and then a gold bar finds its way to Rhyolite, and figures in the press dispatches. Skidoo, on the west slope of the Panamints, disputes the Death Valley's supremacy. From Bob Montgomery's camp come reports of forty miners delving into 'picture-value' ore. Skidoo's mill of 10 stamps is completed and at work. The monthly output is said to be $10,000. Skidoo insists that it is part and parcel of Death Valley, though it more properly belongs to the Panamint valley.

Not far from Saratoga Springs, at the extremity of the south arm of Death Valley, the hustling little supply-camp of Silver Lake is kept alive by a large mining district that extends from the Shadow mountains on the east to the Avawatz on the west. Greenwater is still trying to keep itself from utter collapse. Following the New Year, when rumor had it that Panamint Tom, an ancient Shoshone warrior, with his squaw, was hibernating on the Greenwater bank, a force of men, about a half a dozen miners, went to work in the copper properties. Occasionally the long-silent telephone wires to Rhyolite dropped whisperings of fancy 'strikes' at Greenwater. These found their way into print, but Greenwater failed to sustain the promise of its earliest boom days for anyone to take much interest in these later murmurs.

Scotty's Death Valley mine has moved up into the Tin mountains. This mine, of the ilk of Peg Leg and Breyfogle, when it sprang into the lime-light, was down at the lower end of the Panamints, near Hidden Spring. Since then it has zig-zagged back and forth across the valley in a northern flight. First it skipped to Funeral range; next to the Panamints near Emigrant Spring. Later it flitted over to the Grapevines and rested till the work of the Keane Wonder made the district too busy. Now it has taken refuge in the isolation of the Tin mountains, probably for the reason that last spring four human skeletons and the bones of six burros, grim relics of a prospecting party, were found in a Tin mountain canyon.

The Borax company has planned an unusually

large amount of assessment work for this fall on its Death Valley properties. It is probable that 50 or more miners will be taken over to Furnace Creek canyon. Each year's work adds thousands of tons of colemanite to the already immeasurable Death Valley store. Meanwhile the Lila C. mine is turning out sufficient borax to supply the American market. Since the transfer of operations from Borate to the new borax camp, Ryan, which is named after John Ryan, who for years has been the company's field representative, the company has kept more than a hundred miners following the extensive colemanite veins of the Lila C. The roaster, begun last spring, is now completed and running with a good force of men. The cabins and bunk-houses have been moved to Ryan from Borate. The Tonopah & Tidewater railroad has opened up the territory east of Death Valley. This region in three years has become quite well known. The soda lake, on the Mojave desert, near the ruined fort on the overland trail, which was once worked for its soda, is receiving the attention of two groups of capitalists, now that a railroad touches its very edge. Along the walls of Amargosa canyon nitrate beds have been discovered. They are low-grade deposits. Nevertheless, they look promising enough for someone—rumor says it is the Borax company—to take up the ground and do considerable assessment work. Death Valley's final contribution to the world's wealth seems more likely to come from such minerals as borax and nitre than from precious metals.

Suitable refined oils may be determined by the following simple tests, according to J. C. Christensen in the June issue of *California Derrick*: Gasoline should burn with a blue flame in the usual form of burner. If it does not, too much 'heavy oil' is present. Benzine which is used for cleaning clothes should evaporate from a fabric within a reasonable time, leaving no pronounced odor on the goods. Turpentine substitutes should evaporate from a piece of white paper in less than 45 minutes, leaving no grease spot. Kerosene need be tested only for flash-point, sulphur, and burning qualities. Kerosene is supposed to be burned in a lamp. If it will not burn, the fact can be ascertained only by trial; and if it will burn, what is the use of further tests? The reason why an oil will not burn may be very difficult to ascertain, and may involve years of chemical research. Borneo oil, it is said, will not burn in flat-wicked lamps, but will burn well in lamps with a central draught. California oils, if improperly refined, behave in the opposite manner. Viscosity is the prime requisite of a lubricant. If the oil has the proper viscosity, is free from acids, alkalis, and gum-forming bodies, it will undoubtedly give satisfaction. Here also if an oil is unsatisfactory, the reason and remedy may be very hard to discover.

Oil-burning boilers are to be used on ten new torpedo-boat destroyers for the British Navy. Burners which do not require the use of steam or compressed air for atomization will be used, consequently the oil will be put under pressure and heated to the flash-point before passing to the burners.

ROCK PRESSURE AND METAMORPHISM.

Written for the MINING AND SCIENTIFIC PRESS
By H. M. CHANCE.

While in many contributions to the literature of metamorphism, rock pressure is treated as an important factor in changing the arrangement of the mineral constituents of rock masses, in indurating, in dehydrating, and in welding the loose agglomerates into cohesive rocks, the subject does not seem to have received the attention nor to have been given the prominence that its importance merits; nor has the possible presence of enormous stresses in any or all parts of the lithosphere been sufficiently emphasized. These stresses are limited only by the ultimate strength of the rock-masses in which they develop, and to the pressure under which rocks may flow as liquid or plastic bodies, and may exist not only at great depth, but also in rock-masses at or immediately beneath the surface. What may be termed lithostatic pressure, that is, the pressure due to the weight of the overlying strata, may be computed approximately at one pound per square inch for each foot in depth. For example, this pressure at a depth of 2000 ft. beneath the surface is about 2000 lb. per square inch, and in like ratio for other depths. As shown by me several years ago, this lithostatic pressure limits the possible underground pressure of gases, for when the gas pressure exceeds the lithostatic pressure, the formations will be lifted and broken and the gases escape.

If this were the sole compressive stress to which the rocks are subjected, no considerable metamorphism by 'welding,' that is, cementation or induration, would be expected to result from this cause except at depths of many thousands of feet, perhaps 20,000 to 50,000 or more, below the surface. The pressure due to thrust may, however, enormously exceed the lithostatic pressure, and these thrust-stresses may be very great at slight depths beneath the surface, or indeed quite near the surface. The possible stress due to thrust may best be conceived and calculated by imagining the earth's crust to consist of a series of concentric and unsupported rock rings, domes, or zones. If the stresses in such rings be computed by treating each ring as an arch, it will be found that the stresses are greatest in the outside, superficial ring, steadily diminishing toward the centre, and that in the outside ring the compressive stress is approximately 20,000,000 lb. per square inch, this being the pressure, or thrust, developed in an arch of 4000 miles radius and constructed of material having the average weight per cubic foot of ordinary sandstone. It cannot, however, be assumed that such pressures actually exist for even a limited time or throughout a circumscribed rock-mass, for the underlying rocks must always afford some support to portions of any rock-shell which may become partly suspended, and also because the arched formations will break by crushing long before the pressure produces such an enormous compressive strain.

It is, however, unquestionable that these thrust-stresses are very great, and are sufficient to account for many of the phenomena usually ascribed to

cementation by silicification, for whenever, through any cause, the sinking of the underlying rocks has for a time left any portion of the lithosphere unsupported except by its own strength as an arch, enormous pressures are produced; the resultants of the forces involved tending to produce stresses far beyond the ultimate strength of any known substance, and the effect of which it may be difficult to surmise. An objection to this argument may be made on the ground that subsidence of underlying rocks accompanied by unsupported arching of an overlying belt or ring will seldom occur, and therefore that such stresses will rarely be produced, and with this contention I am in thorough agreement, having introduced the foregoing hypothesis to illustrate how such stresses might arise, and how they may be estimated. The real condition differs from this simple conception, and requires the introduction of another physical factor, namely, the elasticity of rocks. All rocks are more or less elastic and correspondingly compressible, and, under the compressive force of the lithostatic pressure, or absolute weight, they yield, occupying less space, that is, decreasing in bulk. The effect of this compression is, in a measure, the same as though the underlying rock-mass had subsided, and no longer sustained the whole weight of the overlying strata, which must then act as an arch, as regards such unsupported weight, developing enormous thrust-stresses, or must break and settle upon the underlying rock-mass.

Compressive stresses existing in rocks at the surface have been noted by a number of observers, being mentioned by Van Hise and others as showing sufficient stress to produce a measurable compression even in granite. An instance is cited by Van Hise in which granite blocks visibly expanded after being detached or cut loose from the main rock-mass in ordinary quarrying operations. More striking instances are found in the 'swelling ground' of some mines, where the stresses are sufficient to shear off massive rocks, closing drifts and cross-cuts driven in solid and undisturbed ground. Hence it seems reasonable to assume that the 'thrust of the arch' underground, and also close to the surface, produces pressures limited only by the ultimate strength of the rocks, and that the resultant stresses are sufficient to account, (1) for the cementation by 'welding' of loose and non-cohesive materials, such as fragmental and volcanic sediments and deposits, into cohesive rocks; (2) for the fracturing which has produced the breccias; (3) and for the development of cleavage (schistosity) and joint-planes.

From purely mathematical considerations it is evident that thrust-stresses developed by the arching of any rock-mass, whether from the actual uplifting of the mass, due to the subsiding of the underlying rocks, or from the compression of such underlying rocks due to their elasticity, must bear a definite relation to the radius of the arch so formed, being greater when this radius is large and less when the radius is relatively small; and further, that all lateral thrust-stresses, other than those produced by igneous eruptive pressures, must in their final analysis be attributed to this cause. To distinguish these stresses from those produced by igneous eruptions, and also from the lithostatic pressure, the term arch-thrust is suggested. Arch-thrust stresses are produced artificially in mining and are doubtless an important factor in bringing on 'crushes' or 'squeezes.' In view of the disasters caused by the crushing of coal pillars by the development of 'squeezes' it is remarkable that few engineers have directed attention to the fact that many mine-closures are caused by the 'thrust of the arch.' In these cases the development of a thrust many times that of the weight of the overlying strata, is brought about by the partial removal of support from beneath a considerable area, pillars of coal amply sufficient to sustain the weight of the overlying mass being crushed to powder by the thrust. Conditions which give rise to the development of arch-thrust stresses will rarely affect all parts of any formation uniformly, for while some parts of the formation may be subjected to destructive stresses, other portions may, by reason of faulting, or by reason of being within a zone in which the resolution of forces produces less thrust, be subjected to pressure no greater than the local lithostatic pressure, and may thus escape the metamorphic changes produced by the greater pressures. In other words, metamorphism by arch-thrust stresses, differs from that produced by lithostatic pressure, in that it may vary locally and without reference to depth, whereas metamorphism due to lithostatic pressure should be uniform for any given depth, and should vary with the depth. Metamorphism by arch-thrust stresses furnishes an explanation of the variations observed in cementation of the sedimentaries, especially of the sandstones and grits, which in some localities may be completely cemented, in fact almost converted into quartzites, while at other places near by they may retain the loose-grained, porous structure of slightly cemented sand-beds. It thus becomes evident that enormous pressure and stresses must continually be present in portions of the superficial as well as in the deeply buried portions of the lithosphere; that these stresses are due to arch-thrust and may readily account for cementation by 'welding,' brecciation, faulting, and the development of cleavage (schistosity), and joint-planes, near or at the surface as well as at considerable depths; and further, that the phenomena of rock-flow under pressure, dehydration, distortion of bedding, and of structure, the development of crystalline rock-structure and the transposition or rearrangement of the mineral constituents of rock-masses are not necessarily confined to deeply buried rocks, but may also occur at or near the surface. If this be true, it is no longer necessary to ascribe cementation to silicification or silication upon a gigantic scale, involving the removal from rocks near the surface and the reprecipitation in the deeply buried formations of vast quantities of silica; nor is the presence of water essential to cementing or indurating processes which are brought about by arch-thrust stresses. On the contrary, such cementation and induration would seem more likely to become complete in partly dehydrated materials, or at least in materials from

which the surplus water had been squeezed out of the pores. Possibly such pressures acting in moderately elevated temperatures will more rapidly bring about complete cementation than at lower temperatures, and if the temperature be high enough to drive off most of the combined water, more complete metamorphism, and the production of highly crystalline rock-masses, with re-arrangement or re-crystallization of minerals, may be more likely to result; but it does not seem necessary to assume high temperatures to bring about those changes, for pressure, time, and chemical activity are probably competent to effect profound changes in the physical and chemical constitution of rocks.

This hypothesis appears to furnish a more plausible and rational explanation of many phenomena of metamorphism than that which assigns to percolating and circulating waters the principal rôle in bringing about such changes. I have in mind more particularly the phenomena observed in the sedimentaries, but believe the same considerations will apply with equal force to changes in rocks of igneous origin. Those who have given much attention to the study of the sedimentaries will be slow to admit any general, and especially and vertical circulation of ground-waters which would account for cementation by the transportation and precipitation of silica sufficient in quantity to fill the interstices of the more porous sedimentaries. The theory is met at the outset by the objection that surface-waters rarely penetrate to any considerable depth; that deep mines are usually dry mines, and that deep bore-holes are usually dry holes, and that the dryness of the underground is actual, not relative, that is, that deep mines are not only dry, but often are dusty. The exceptions are of course found in mines opened on 'fissure veins' and in bore-holes sunk in artesian districts; but these exceptions merely emphasize the rule. Again, the history of drilling in sedimentaries shows that after passing below the surface-water horizon, which rarely extends to more than a few hundred feet in depth, either the rocks are dry, or they contain salt water, that is, brine, and the brine is frequently quite pure. Where such conditions exist, it is evident that silica is not continuously being carried in solution from the superficial to the deeply-buried formations. The existence of large areas underlaid by shales, slates, and sandstones permeated with oil and gas, prevents the application of this theory to the cementation of rocks in such districts.

The application of such theories to cementation and also to the formation of ore deposits by precipitation, requires that precipitation shall take place, but without in the first case furnishing a valid reason for such action. Precipitation involves either the addition of some reagent by which the substance is thrown out of solution, that the solution be a concentrated solution, that the specific gravity of the solution be changed by the addition or removal of water, that its temperature or pressure be changed, or that it be subjected to electrolysis. If the almost universal cementation of sedimentary rocks be due to the addition of silica brought in by circulating waters, then we should be able to furnish a plausible reason why these waters should deposit this silica in the interstices, removing nothing, that is, dissolving no part of the rock-mass. In applying any theory of carriage by circulating waters to the formation of ore deposits, the same difficulty is experienced, but precipitation can plausibly be explained by assuming that the mineralized waters commingle with other waters carrying a precipitating reagent, or that they react upon the rock-mass in which the metalliferous precipitate is being deposited.

Cementation by the deposition of small quantities of silica or silicates, barely sufficient to cement the individual sand-grains, may not improbably be brought about in the entire absence of circulation by dead waters occupying the pores of any unsolidified material, for this water may dissolve small quantities of silica from the sand grains and re-deposit it upon them, the water remaining practically a concentrated solution of silica or silicates throughout the process. This affords an explanation of the cementation of sand-beds lying in unsolidified sedimentaries at depths beneath the surface too shallow to permit of cementation by 'welding,' for at a shallow depth lithostatic pressure is insufficient for the purpose, and in entirely unsolidified and unconfined surface-sedimentaries arch-thrust stresses must be a small and unimportant factor. The application of this arch-thrust theory is restricted to cemented or solidified, and to partly cemented, solidified, or slightly indurated materials, requiring that before the development of arch-thrust stresses, lithostatic pressure or chemical solution and precipitation or possibly cementing by re-arrangement, shall have converted the non-cohesive materials into partly solidified deposits, or that cementation by precipitation of calcareous or silicious matter, or silica, as described by Van Hise, shall have performed the same function; for no arch-thrust stresses much exceeding the lithostatic pressure can develop in loose and unconfined materials. In applying this reasoning to rocks within the zone capable of observation, it becomes necessary to consider the conditions under which the phenomena of rock-flowage and the development of crystalline structure are possible. Experimentation has not progressed far enough to define the pressures which will develop either flowage or crystalline structures in large rock-masses, and the results so far attained do not harmonize very well with the conclusions reached from observation.

Rocks are exposed in many localities which have been buried beneath 20,000 or 30,000 ft. of superincumbent strata, and yet exhibit no well-developed evidence of flowage or of crystalline structure, although the pressures to which they have been subjected have been not less than 20,000 to 30,000 lb. per square inch. While the experiments of Adams, Nicolson, and others indicate that deformation and re-arrangement commence at much lower pressures, many experiments involving pressures greatly in excess of 100,000 lb. per square inch have entirely failed to produce any effect other than that of crushing the rock to powder. The data in hand

seem to point to the conclusion that time (long continued pressure) is an element of greater importance in producing flowage and crystalline structure than the intensity of the compressive stresses, and that such changes are facilitated by the presence of small quantities of water. However this may be, it seems certain that the intensity of arch-thrust stresses must always be limited to the pressure necessary to produce flowage, for when the thrust exceeds this pressure the rocks by yielding will prevent the development of any greater stress. In order that greater pressure may exist, the materials must be confined, and as lithostatic pressure is the only force by which they can be confined, the possible pressure at any depth will be that necessary to produce flowage, plus the lithostatic pressure.

If flowage and crystalline structure be dependent upon lithostatic pressure alone, then the zone of flowage must be at a depth beneath the surface corresponding to this pressure, but if these conditions are developed by arch-thrust stresses they may be produced at, near, or at any depth beneath the surface. These considerations may disturb our ideas of fixed zones of metamorphism occurring only at certain depths beneath the surface, and may modify our theories regarding zones of fracture and falting, especially as applied to the deposition of ores and to the possible extension in depth of conditions favorable to ore deposition, for if arch-thrust stresses produce fracturing, faulting, and metamorphism, these phenomena may often be limited to a superficial zone in which such stresses have developed. Preference has been given to a discussion of these stresses viewed as resulting from arch-thrusts rather than dome-thrusts, because it appears that in a large majority of instances the form will approximate that of an arch or of a greatly elongated ellipsoidal dome, rather than that of a spherical dome; and the resultant stresses in the arch, being normal to its axis, more readily account for shearing, cleavage, faulting, and the various phenomena of flowage. The lateral stresses developed in a dome are in all directions, and are parallel to its curvature, whereas in the arch these stresses are all at right angles to the axis of the arch, and at any given point exert a thrust in but one direction. Another effect of arch-thrust stresses is that rocks within the affected zone or belt are compressed, and liquids occupying their pores may be squeezed out, and forced into other regions, belts, or zones. If such liquids carry considerable quantities of heavy metal salts in solution, which may easily be true of dead-water occupying the pores of any rock, ore deposits may be produced in the joints, fault-planes, or pores of any rock into which these waters are forced.

The slide-rule was invented by Gunter shortly after his discovery of logarithms in 1620. As first used it consisted of a logarithmic scale on a rule, the logarithms being added and subtracted by the use of dividers. This scheme was improved by Wingate, who used two separate rules sliding against each other so that the logarithms could be added mechanically. In 1657 Patridge introduced the slide-rule in essentially its present form.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

BREACH OF CONTRACT—SUBSTITUTE FOR DAMAGES.

A contract for the sale of a mining claim provided that on non-compliance with any of its terms the purchaser should forfeit all machinery and appliances placed on such claims, and that such forfeiture should be in full liquidation of all claims and demands. This was held to provide for the measure of damages for the breach of the contract, to the exclusion of a remedy by cancellation of the contract of sale, or specific performance.

Mallory *v.* Globe Boston Copper Mining Co. (Ariz.), 94 Pac. 1116, March, '08.

NOTICE OF LOCATION OF MINING CLAIMS.

Notices of the location of mining claims were sufficient where they contained such a description of the locality of the claim by reference to natural landmarks or permanent objects as to render the situation of the same reasonably certain from the letter of the notice itself.

Bismark Mt. Gold Mining Co., *v.* North Sunbeam Gold Co. (Idaho), 95 Pac. 14, March, '08.

LOCATION OF MINING CLAIM—NATURAL OBJECTS.

The purpose of the law in requiring the location of mining claims to be made with reference to some natural object or permanent monument is said to be for the purpose of directing attention in a general way to the vicinity or locality in which such mining claims were to be found; but the natural objects or permanent monuments required may be either on or off the ground located.

Bismark Mt. Gold Mining Co., *v.* North Sunbeam Gold Co. (Idaho), 95 Pac. 14, March, '08.

CONTRACT FOR SALE OF MINE—PERFORMANCE OF CONDITIONS.

A contract for the sale of mining claims which provided that the purchaser should run certain cross-cuts, shafts, and drifts, will not be specifically enforced where there is no time specified in the agreement when the work should be done, and where there was no allegation that the plaintiffs had been damaged by the failure to perform these particular acts.

Mallory *v.* Globe Boston Copper Mining Co. (Ariz.), 94 Pac. 1116, March, '08.

RESERVATION OF MINERALS IN CONVEYANCE LAND.

A general reservation of all minerals 'in and under' a certain portion of land conveyed, not limited or qualified by any other clause in the deed, or by any facts within the knowledge of the parties which might properly be deemed to have influenced them, was held to include not only solid minerals, such as gold, silver, iron, coal, etc., but also natural gas and oil.

Sult *v.* Hochstetter Oil Co. (W. Va.), 61 Southeast. 307, May, '08.

MINING PROPERTY—PARTITION.

Ordinarily mining property is not susceptible of partition, and the usual practice is for a court to order the property sold and the proceeds divided. But it seems that under the statutes of Alaska a division of the property must be made; and the court shall appoint three referees to make the division and allot the several interests. Personal property connected with such mining property must be dealt with in the same manner, and could not be sold by a receiver appointed by the court.

Mauley *v.* Boone, 159 Fed. 633, Feb., '08.

MINING CLAIM—RE-LOCATION.

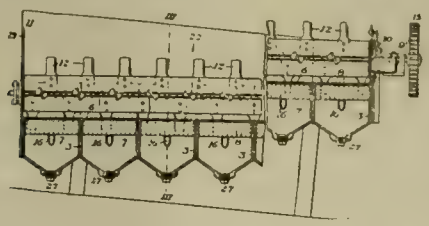
There can be no re-location of a mining claim while it is in the actual possession of persons who have done the requisite amount of assessment work, although under an insufficient location. The rule is that for the purpose of re-location, the land must be open and subject to location.

Ware *v.* White, (Ark.) 108 Southwest. 831, Jan., '08.

MINING AND METALLURGICAL PATENTS.

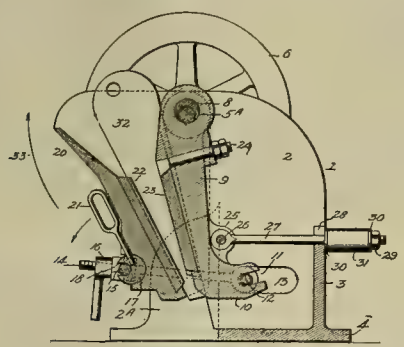
Specially reported for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR THE CONCENTRATION OF ORES AND MINERALS.—No. 895,363. John C. Greenway, Coleraine, Minnesota.



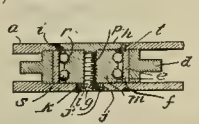
A concentrator for ore and other materials, comprising an elongated trough-like vessel, the major portion of whose bottom is provided with closely adjacent small holes or perforations therethrough, a water compartment below said bottom, from which water under pressure is admitted through said perforations, and means for mechanically moving the ore or other material longitudinally in one direction in the vessel and for permitting the water to carry off in suspension the gangue and other material in the opposite direction.

CRUSHER FOR ORE AND OTHER MATERIALS.—No. 893,713. Henry Eggers, Denver, Colorado.



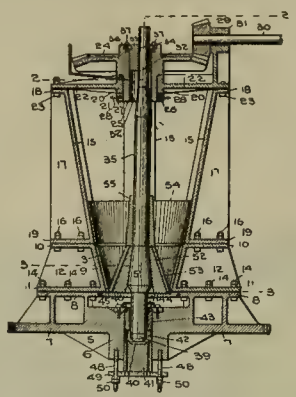
In an ore and rock crusher, the combination with the main frame, of the crusher frame, having a stationary jaw; an oscillating jaw arranged in operative relation to said stationary jaw, a recess in said swinging jaw, a pin journaled in said recess, a pair of tie bars positioned one on each side of said frame, provided with eyes at one end fitting loosely over the opposite ends of said pin, and having their opposite ends threaded, an abutment bearing adjacent to said stationary jaw in said crusher frame, a rotatable tie bars loosening and tightening eccentric abutment sleeve mounted in said abutment bearing, and provided with an open slot portion in its side, a link in said side slot extending across said frame, eye portions on the opposite ends of said link fitting loosely over the threaded end portions of said tie rods, and a handled nut threaded to the threaded ends of each rod and arranged to screw against the eye portions of said link and clamp it and its eccentric sleeve to the abutment bearing of said frame, and means including a handle connected to said eccentric sleeve for rotating it to instantly loosen said tie rode and release said jaw from its set positions relative to said fixed jaw.

COAL-MINING MACHINE.—No. 895,449. John P. Gilmour, Terre Haute, Indiana.



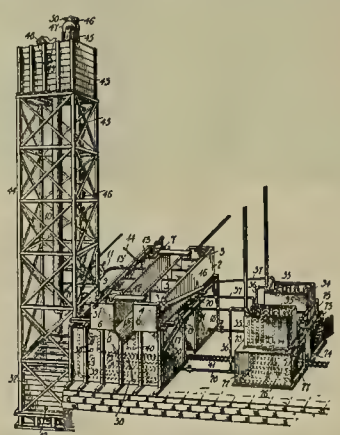
In a cutter-head, the combination with a frame comprising side plates, one of which is provided with an opening having an inwardly beveled wall and the other of which is provided with a threaded opening, of a bolt disposed transversely in the frame and threaded oppositely to the threaded opening in one frame plate and having a cap or head occupying the opening in the other frame plate and having its edge beveled correspondingly to the wall of the latter opening, an exteriorly threaded disk arranged in the threaded opening of the frame plate and having a threaded aperture receiving the threaded bolt, an interiorly threaded journal mounted on the threaded bolt and disposed between the frame plates, a wheel surrounding the said journal, and a cutter chain passed over the wheel.

GYRATORY CRUSHER.—No. 895,633. Charles L. Hathaway, Denver, Colorado.



In a crushing machine a mortar, a crushing head within the mortar, a shaft carrying the head and extending below the lower end of the mortar, means engaging the upper ends of the shaft for imparting a gyratory movement to the shaft and head, means to hold the shaft against downward movement, and means intermediate the lower extremity of the shaft and the head for providing a lateral resistance against the movement of the shaft.

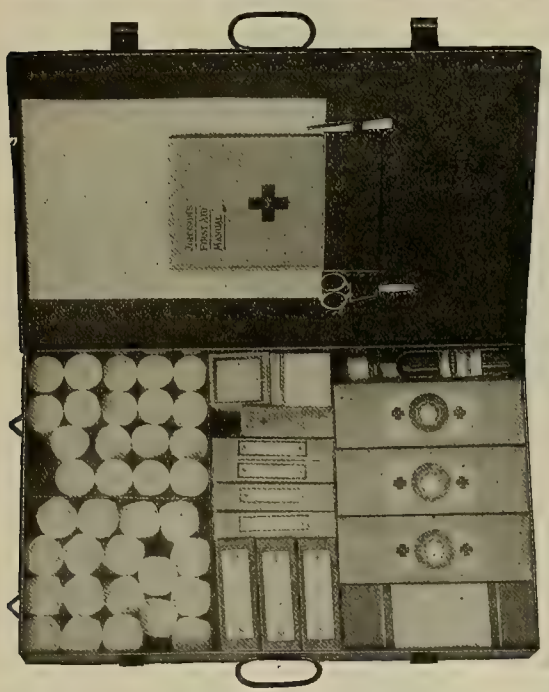
PROCESS OF SAVING THE VALUES OF CONCENTRATES AND SLIMES.—No. 895,509. Stephen M. Smith, Boise, Idaho.



The process of separating ore slimes from crushed ore or gangue and recovering the slime, which consists in introducing the crushed ore or gangue containing the slime into a receptacle, subjecting the material therein to the action of the water, whereby the slime will be separated from the crushed ore or gangue and will flow out over the edge of the receptacle with the water, the slime by the addition of washing water being greatly diluted, conveying the water carrying the slime in suspension into a receptacle, and uniformly heating the same throughout without boiling, agitating or boiling currents in the water containing the slime, whereby the slime is caused to precipitate without disturbance, and then drawing off the water from from slime from the receptacle.

First-Aid in Accidents.

The greatest danger to wounds from accidents is due to contamination with foreign substances, not always visible(but far-reaching in effect. Germs quickly find lodgment in any wound by transference from the air, the clothing, the skin; in fact, from anything that may come in contact with it. In consequence of such contamination, blood poisoning, gangrene, inflammation, fever, erysipelas, and a train of complications are liable to follow any wound. Small scratches and pricks, when not properly cared for, may result in inflammation and the formation of gatherings or abscesses, which will disable a person for a considerable time or cause the loss of a limb, or even endanger life itself. A knowledge of these facts has led to the triumphant progress of modern surgery. The application of the principles involved has soother untold suffering and saved millions of lives. The necessity and value of prompt and efficient first-aid in injuries needs no comment. During the war with Spain, in the Philippine campaigns, and in the war in South Africa it has been established that, by the prompt application of first-aid dressings, the loss of life and limb has been reduced to the



lowest ratio in the history of warfare. The modern practice of surgery requires that the dressings applied to a wound shall not only look clean, but shall be surgically clean (that is, aseptic); free from germs. From the surgeon's standpoint, a piece of spotless linen may be a filthy rag; he does not judge from the looks, but by his knowledge of the effects.

In order that the beneficial effects of modern surgical methods may be applied to any wound, from accidents at home, in the shop, the factory, railway service, mine, camp, or wherever accidents may occur, Johnson & Johnson have devised a system of first-aid appliances. This firm is known all over the world as makers of surgical dressings that fulfill the requirements of modern surgery. They are the pioneers in making these dressings. They have revolutionized the methods of manufacture, and by their skill and industry have made the application of surgical cleanliness in modern surgery possible, not only in large hospital centres, but in the most out-of-the-way places. The prompt use of the material applied according to this system has saved many lives. This system has received the special endorsement of thousands of railroad, mining, and factory surgeons, as well as those connected with fire, police, and municipal departments.

The cabinet is so arranged and the contents so selected that temporary aid can be rendered by any layman, and when the surgeon arrives he will find proper material for the first dressing of any conceivable injury. The dressings are simple and complete, and the contents of the cabinet are not only applicable to injuries of any nature, but are sufficient in quantity to provide for a large number at one time. It is not essential to the successful use of this cabinet that the operator should be skilled in anatomy, physiology, or surgery. Any intelligent foreman by the aid of the accompanying Manual can render efficient first-aid in an emergency. There is no possibility of applying the wrong material. In other words, no harm can result from applying any bandage or material contained in the cabinet. The general directions accompanying these cabinets are: "Send for a surgeon, and while waiting apply the proper bandage." The appliances in the Johnson's First-Aid Cabinet are similar to those supplied to the army and navy. The contents of the cabinet are two Johnson's First-Aid for wounds; two ounces Red Cross absorbent lint; one capsule iodoform gauze; six packages Red Cross absorbent gauze, each containing one yard; four packages Red Cross absorbent cotton, each containing 4 oz.; one spool Johnson's 'Z O' adhesive plaster, 1 in. wide; nine Red Cross cotton roller bandages, 2 in. wide; nine Red Cross cotton roller bandages, 2½ in. wide; nine Red Cross linton gauze bandages, 2 in. wide; nine Red Cross linton gauze bandages, 2½ in. wide; one jar carbolized petrolatum; two packages safety pins; one Johnson's First-Aid Manual.

The dimensions of the cabinet are: length, 21 in.; width, 14½ in.; depth, 3½ in. It is made of japanned metal, with strong hinges and fasteners, hangers to hang the cabinet against the wall, and convenient handles for carrying. The contents are so packed as to be readily accessible. Simple directions for the use of the various articles are printed upon the inside of the cover; and in each case a Manual is enclosed giving explicit directions for the treatment of injuries before the arrival of the surgeon.

Commercial Paragraphs.

Walter S. Keith, formerly with the Oregon S. & R. Co., at Sumpter, Oregon, has opened offices as a consulting metallurgist at Seattle, Washington.

The Byron Jackson Iron Works, San Francisco, has recently shipped a two-stage vertical pump to the Springfield Tunnel & Development Co., Sonora, Tuolumne county, California.

The Allis Chalmers Co. announces that E. W. Lindquist, formerly chief engineer of the mining department at Milwaukee, is now permanently at the San Francisco branch house.

The C. O. Bartlett & Snow Co., Cleveland, announces that it has recently received the contract for a complete steel tipple from the Crow's Nest Pass Coal Co., Fernie, British Columbia.

Paul Stockton is opening up a large marble quarry in Mariposa county, and will be in the market for the purchase of equipment for quarrying and stone dressing. His address is San Jose, California.

The Deister Concentrator Co., Fort Wayne, Ind., has sold 16 of its No. 1 tables to the Champion Copper Co., Freda, Michigan, and three No. 3 tables to the Arizona Gold M. & M. Co., Patagonia, Arizona.

F. G. Clapp has resigned from the U. S. Geological Survey and has formed a partnership with A. W. Bee, Jr., civil engineer, for the purpose of engaging in the practice of geological engineering. The office of the firm is at Pittsburg.

The Wagner Electric Mfg. Co. are now well established in their new plant at St. Louis, Mo. The equipment is of the very best, and every means is taken to secure efficiency and economy in shop practice. The San Francisco branch has just moved to 312 Balboa Bdg., and a complete stock of the products of this Company is carried in San Francisco.

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EDITORIAL.

PROPHESY of certain conditions in the business world for the coming winter may be made with a fair degree of confidence. The general feature of the situation at present is a shortening of stocks. The most necessary supplies are not being renewed, and a period of active demand must soon begin. The failure of dealers in coal to lay in the normal winter stock has been noticeable in all parts of the country. The same is true of dealers in lumber and all staple commodities. The result will presently be a traffic congestion, and a sudden increase in prices, both wholesale and retail, out of proportion to any actual recuperation of industry. Another noticeable feature of the summer months has been the widespread reluctance of the farmers to forward crops to market, despite the attraction of higher prices. This situation points to speculation and unhealthy conditions of the market in the late fall and early winter months. This would argue against any permanent advance in metal prices in the near future, with the prospect of spurts which may produce brief sensations. The copper market, which has come to be recognized more than ever as a sensitive trade barometer, has been weak and unsatisfactory throughout the month of August. There was a feeble but temporary advance, then a retreat to 13.12 cents on August 3. The price has since recovered slightly, standing now at 13.50. The foreign purchases have not been large, and it is currently reported that copper stocks abroad are ample for actual needs for a considerable period. Following their usual custom, the European brokers have replenished at the low prices prevailing, but purchases slacken with the least strengthening of the market. The indications are that the production of copper at present is largely in excess of any visible demands. Hence a marked rise in value must bring out large quantities of the metal, with the inevitable reaction in quotations.

CONSERVATION OF RESOURCES is the new slogan, and a right good one it is. Amid all the shouting and furore of the Roosevelt administration, amid the confusion of applause and vituperation, one great sobering conviction has been planted in the minds of the people. Mr. Roosevelt has convicted the nation of ruthless waste; he has bidden it pause and consider the future; he has shown the inevitable penalty of reckless dissipation of the gifts of nature. Perhaps this is the great contribution of this strenuous President to his people, by which his name will be held in esteem admitting of no qualification. The man who builds for the good of all men and of generations yet unborn, builds particularly well. He is in the largest sense a benefactor, and is advancing the development of the race to-

ward that regard for the rights of each individual in our common patrimony which has long seemed like an unattainable utopian ideal. Mr. George Otis Smith reminds us, in a recent address, of which we publish an abstract in this issue, of the strong words of a noted scientist, who said, "future historians will date the end of barbarism from the time when generations begin to feel that they rightfully have no more than a life-estate in this sphere, with no right to squander the inheritance of their kind." This is the new gospel of the practical world, which re-states the golden rule, and insists, with the old militant spirit of every prophet who has had a true message for the world, that it must be observed.

WASTE OF HUMAN LIFE has become one of the subjects to which our Government has lately directed special attention. In the coal mines alone fatalities to the number of 3124 are reported for 1907, which represent an increase of fifty per cent over those for 1906. This, of course, is phenomenal, but it justifies the investigation undertaken by the technologic branch of the United States Geological Survey to ascertain more accurately the conditions under which explosions occur. From these will naturally follow improvements in modern practice. To this end an explosion experiment-station is being equipped at Pittsburg. An agent has also been sent abroad to collect information concerning European methods, involving both measures for safety and for prevention of waste. The two go hand in hand, for the perils of coal mining are greatly aggravated by conditions leading to the production of dust, and to excessive quantities of fine coal which finds its way into the 'gob.' In the regulation of mining operations this country has lagged far in the rear of England, Belgium, France, and Germany. Restrictive legislation in those countries has become elaborate, and has been based upon the results of careful investigation by commissions representing applied science in its highest sense. In order that the United States may profit by foreign criticism without delay, invitations have been extended to those countries where efficient growth of mine-regulation has occurred, asking that representative experts in mine supervision be sent to inspect the coal mines in the several States and advise ways for their betterment.

ECONOMY in any particular always involves a correlation of economies in general. Neither evils nor blessings appear to come singly. So the conservation of natural resources reveals a chain of advantages. We pointed this out some time ago in showing how the preservation of the forests, to take these as a starting point, called for an extension of the use of creosoted timber, and how that necessitated a large production of creosote oil which can come only from bituminous coal-tar. That in turn demands an extension of retort-coking, replacing the criminal waste now ensuing from the almost universal American practice of making bee-hive coke. The bee-hive oven is almost obsolete abroad, while the skies over the Connellsville basin in Pennsylvania are red with the glow from spendthrift fires that should never be permitted to burn. This prodigal waste appears in every coalfield of the country. The adoption of by-product coking will yield a surplus gas which, if not otherwise needed, may be converted into electrical energy; it will produce many valuable distillates; and large quantities of tar which is useful as a binding material for road-metal, as has been demonstrated conclusively in the East and abroad. Furthermore, fixation of nitrogen takes place in the process on a large scale, producing ammonia which will be useful in absorbing the excess of sulphuric acid which must result from the suppression of fume from smelting-works. Thus the farmer will enrich his soil with inexpensive ammonium sulphate, and the smelter will at last become doubly his friend. The relatively close geographical association of great coalfields in America with centres for smelting, and with extensive sources of timber, is most important, and the development of such a chain of conservative operations as we have outlined must shortly mark a forward step in our industrial life.

Creosoting of Timber.

WITH wealth being wasted in the bee-hive coking of American coals, and with creosoting of timbers appealing to the people as a practical and important means for checking the enormous draft upon the forests brought about by increase of population and expansion of industry, all the creosote oil used as a preservative in this country is still imported from England. The sole reason for this is that the American creosote is liable to contain impurities derived from other fuels than bituminous coal in gas manufacture, the domestic product being derived almost wholly from gas-liquors. This condition will be altered with the extension of by-product coking. Well-creosoted timbers last indefinitely. It is only an admission of imperfect work, or of the use of impure material, to attempt to set a limit to the endurance of wood which has been properly treated. Piles submerged 45 years have remained unchanged, and have shown the presence of eight pounds of oil per cubic foot of the timber, which is as much as could have been driven into the wood 45 years ago. Today the average quantity absorbed is about nine pounds per cubic foot, and rarely rises above fourteen pounds. These weights correspond closely to the weight of water removed from the timber in the process. The simple methods of coating timber with preservatives may do positive harm unless kiln-dried or thoroughly seasoned timber be employed. The coating will otherwise lock up moisture in the wood which will produce dry-rot, and soon leave only an empty shell. The same trouble used to occur with creosoted timbers before it had become customary to eliminate the original moisture. At the present time this is done by subjecting the timbers in the treating-cylinder to dry-heat from steam coils, and to live-steam, simultaneously, the temperature being kept below 200 degrees Fahrenheit for several hours. The creosote oil is then turned in, and the steam heating is continued by means of the coils, keeping the tem-

perature of the bath close to 220 degrees. Creosote oil is a distillate with a specific gravity of 1.04, obtained at a temperature exceeding 600 degrees. Consequently it will not evaporate at the temperature of the bath, but the moisture in the timber will continue to be given off. This is continued with the aid of about ten pounds vacuum per square inch, until the rate of elimination of water is reduced to one-fourth of a pound per hour. By that time the total water evaporated will range from eight to fourteen pounds per cubic foot of timber, and approximately the same amount of creosote oil will be re-absorbed in its place. To saturate the wood, however, force must be applied. The cylinder is accordingly flooded full of the creosote oil, and a pressure of twelve pounds per square inch is developed with a pump. The cost of creosoting on the Pacific Coast, where the oil costs about 16 cents per pound delivered, is from $20 to $25 per thousand feet board measure. The timber after treatment weighs more than the ordinary seasoned lumber, and the freights will be proportionally higher, this extra weight being about 300 pounds per thousand feet. In spite of all this, the use of creosoted timbers will undoubtedly soon become general for somewhat more than half the consumption underground by mining companies. Estimates made by the Government less than a year ago indicate that 45 per cent of all mine timbers fail because of decay, and 10 per cent are destroyed by insects. Against these creosote oil will insure protection. Of the remaining 45 per cent, the waste amounted to 10 per cent of the total consumption, which would be distributed between treated and untreated timber where both were employed. There would also be a small additional expense from the necessity of applying a coating of creosote oil to the freshly-sawn ends of all timbers when cut for placing in position, since the preservative fails to penetrate entirely to the centre even under the most highly perfected methods of creosoting in vogue at the present time. Some failures to secure good results with treated timbers have come about through inattention to this detail.

IT HAS been remarked that the movement of laborers to and from Europe is a good indication of the actual state of industry. Immigration statistics constitute only a single chapter in the story. The movement must be studied as a cycle, as a phenomenon of migration, to yield useful deductions. The *padrones* recognized the signs of the times months before our business men fully realized an impending crisis, and the Italian flew as the wild goose flies when winter is coming. The eastward trans-Atlantic flight of steerage passengers became phenomenal as early as May, 1907, and the rush increased from month to month. The unskilled laborer is the first to be dispensed with in times of financial uncertainty. He knows that the condition of the labor-market points toward work and provender, or idleness and starvation, and that the index is infallible. Economists will do well to watch immigration statistics as well as copper quotations to predict the financial weather.

Erosion and Sub-Soil Decomposition.

EROSION of rocks when covered with the soil of a tropical jungle puzzles a correspondent whose letter appears in another column of this issue. The question is quite as pertinent with regard to erosion facilitated by sub-soil decomposition of rocks in the North as in the South. There is no difference between the tropical mantle and the sub-arctic mossy 'muck,' save that there is more of it, and its decomposition-products yield active mineral solvents in greater abundance. In fact, the problem can not be localized. It is all one, wherever we meet it, and the influences operating are essentially the same. The organic acids leached from the soil, energetically attack the underlying rocks. The roots of trees penetrate to great depths, and not only force their way by expansion in crevices of the rocks, but secrete acids which attack the rock-constituents and open the way for further growth and penetration of the rootlets. Bacteria also flourish in the upper zone of decomposition of all rocks and hasten the processes of decay. The Pic Pourri of the Bernese Alps, the famous 'Rotten Peak,' is undergoing bacterial decomposition at a rapid rate.

Erosion is commonly considered by the layman to represent chiefly the mechanical effects of heat and cold, of wind, rain, and frost. These are, to be sure, the true eroding agencies, but their larger function is to complete the work prepared in advance by chemical action. The silicates yield readily to the influence of waters carrying carbonic acid and the products of vegetable decay. Those silicates carrying iron in the protoxide form are the first to succumb, and in regions of moderate rainfall a red discoloration of the soil from the resultant ferric oxide is the certain indication of the chemical operations in progress below. In the tropics, and in any region where organic matter is abundant in the soil, this iron will be removed as soluble carbonate. The decomposition of the rock-forming minerals produces effects known as kaolinization, epidotization, and the like, which represent in the aggregate a shrinkage of volume. Such is the net result, although rock-alteration does to some extent produce an increase of volume. The shrinkage from such sub-soil decomposition of rocks amounts to an average of about 60 per cent of the original volume. The actual erosion then is merely a question of the amount of rainfall, and of the carrying-power of the surface-drainage with respect to the soil particles, thus lowering the actual level of the country through removal of rock-material, both chemically and mechanically. In many places very beautiful examples of these progressive denuding effects are to be seen, where the loose pulverulent soil is succeeded downward by increasing coarseness, passing gradually through every phase of rock-decomposition into the hard unaltered rock below. Hence it is seen that the soil offers no impediment to denudation, and if gold be present it will be concentrated in the streams as it is washed down from the valley-slopes, even though the rocks in which it occurred may never appear upon the surface.

Personal.

W. A. IRWIN is at London.

T. LANE CARTER is in Switzerland.

FRANK H. PROBERT is at Globe, Arizona.

R. P. MUNROE is at San Diego, California.

JOHN B. FARISH has returned to Denver.

ARTHUR W. STEVENS is now at Los Angeles.

JOHN MORGAN, of Denver, is at Fairbanks, Alaska.

WILLIAM E. HARRISON has gone to Pioche, Nevada.

WILLIAM NICHOLLS, Jr., is at Berkeley, California.

H. E. WEST will shortly be in New Brunswick, Canada.

W. B. KEHOE has gone from Mexico to Fairbanks, Alaska.

EVAN FISHER has returned to New York from a trip to England.

E. L. BALLOU has moved from Pony, Montana, to Igo, Shasta county, California.

JOHN POWER HUTCHINS, of New York, is in Colorado examining dredging ground.

T. H. JENKS is now with the Cananea, Rio Yaqui & Pacific railroad, at Culiacán, Mexico.

R. C. SHAW left San José, Costa Rica, September 1 for California, by way of New York.

T. L. ODDIE, who has been at New York for some time, has returned to Tonopah, Nevada.

H. L. TWITE, of London, is in Bolivia reporting on the Ocavi tin mines for English clients.

ROBERT M. RAYMOND, of the El Oro Mining & Railway Co., Ltd., El Oro, Mexico, is at Catalina island.

ALEXANDER LEGGAT, of Butte, is at Miles City, Montana, making surveys of mining property for clients.

ALEX COLLEDGE, of Singapore, was in San Francisco, and will sail on the *Lusitania* for London on September 16.

J. H. ATKIN, of Tonopah, Nevada, left San Francisco August 31 on a professional trip to the gold placers of Argentine, South America.

E. S. PETTIS is at Prescott, Arizona, and has recently completed the installation of a reduction plant for the Monica mines, near Kirkland.

FRANKLIN R. CARPENTER has recently completed a survey of the Uinta oilfields, of Wyoming, and is now in the Seven Troughs district of Nevada.

NORVAL J. WELSH has returned to San Antonio, Texas, after a six weeks' profesional trip in the western part of Chihuahua, Mexico, and will shortly be at the Engineers' Club, New York City, for an indefinite stay.

Publications Received.

'The Lime and Cement Resources of Missouri.' By H. A. Buehler. Vol. VI. 2nd Series of the Missouri Bureau of Geology and Mines.

'The Mineral Resources of the Philippine Islands.' Issued by Warren D. Smith, Chief of the Division of Mines, of the Department of the Interior.

'The Iron Ores of the Iron Springs District, Southern Utah.' By C. K. Leith and E. C. Harder. Bulletin No. 338 of the U. S. Geological Survey.

'Contributions to Economic Geology, 1907. Part I—Metals and Nonmetals, except Fuels.' By C. W. Hayes and Waldemar Lindgren. Bulletin No. 340, U. S. Geological Survey.

Dividends.

On September 4 the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 132 of $75,000. This makes the amount of dividends paid since January 1 $630,000, and the total to date $10,446,000.

THE CEMENT SECURITIES Co., of Denver, announces that F. L. Smith & Co., of New York, have been made consulting engineers of the Company.

Latest Market Reports.

LOCAL METAL PRICES—September 3.

Antimony	12@16c	Quicksilver (flask)	$40@42.50
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.95@ 5.90c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Aug 27. £. s. d.	Sept. 3. £. s. d.
Camp Bird	0 14 3	0 13 6
El Oro	1 7 0	1 7 0
Esperanza	3 12 6	3 3 9
Dolores	1 10 0	1 10 0
Oroville Dredging	0 9 6	0 10 0
Stratton's Independence	0 1 0	0 1 0
Tomboy	1 3 9	1 2 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Aug. 28	13.43	4.59	4.58	51¼
" 29	13.43	4.59	4.58	51⅛
" 30	Sunday.	No market.		
" 31	13.43	4.59	4.58	51⅛
Sept. 1	13.43	4.59	4.58	51⅛
" 2	13.50	4.57	4.71	51
" 3	13.50	4.57	4.71	51⅛

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Aug. 27.	Sept. 3.
Amalgamated Copper	79⅞	77⅝
American Smelting & Refining Co.	97¾	92¼
Boston Copper	13	12
Butte Coalition	26¾	26
Cumberland Ely	8½	8¼
Dolores	6⅞	6¾
El Rayo	2¾	2¾
Giroux	4¼	4¼
Greene-Cananea	11⅜	11
Indiana Sonora	5⅛	5⅛
La Rose	5¾	5⅞
Miami Copper	10⅞	11¾
Nevada Consolidated	16⅝	16
Newhouse	6⅛	6¼
Nipissing	8⅞	8¼
Ohio Copper	3¾	3
Tennessee Copper	37¼	38⅛
Utah Copper	44	44½
Yukon	4⅝	4⅜

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 3.

Atlanta	$ 29	Laguna	$ 1.20
Belmont	1.07½	Manhattan Con	8
Booth	45	MacNamara	54
Columbia Mtn	27	Midway	33
Combination Fraction	1.52½	Montana Tonopah	1.30
Daisy	72	Nevada Hills	1.35
Fairview Eagle	35	Rawhide Queen	74
Florence	3.97½	Sandstorm	28
Gold Bar (Bullfrog)	4	Silver Pick	20
Goldfield Con	6.50	St. Ives	29
Gold Kewanas	39	Tonopah Extension	73
Great Bend	35	Tonopah of Nevada	7.50
Jim Butler	27	Tramp Con	16
Jumbo Extension	45	West End	57

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. September 3.		Closing prices. September 3.
Adventure	7¾	Mohawk	65
Ahmeek	98	Nevada Con	16
Allouez	36	North Butte	84¾
Amalgamated	77½	Old Dominion	41⅝
Arcadian	4	Osceola	110¼
Atlantic	14½	Parrot	26½
Bingham Con	50	Phœnix	50
Boston Con	12½	Quincy	92
Butte Coalition	26¼	Rhode Island	4¼
Calumet & Arizona	119½	Santa Fe	2
Calumet & Hecla	660	Shannon	15
Centennial	33	Superior & Pittsburg	14½
Copper Range	78½	Tamarack	75½
Daly-West	9	Trinity	18½
Franklin	13	United Copper Con	10¾
Granby	100	Utah Copper	46¼
Greene-Cananea, ctf	11	Victoria	5
Isle Royale	22⅞	Winona	5
Mass	6	Wolverine	143

General Mining News.

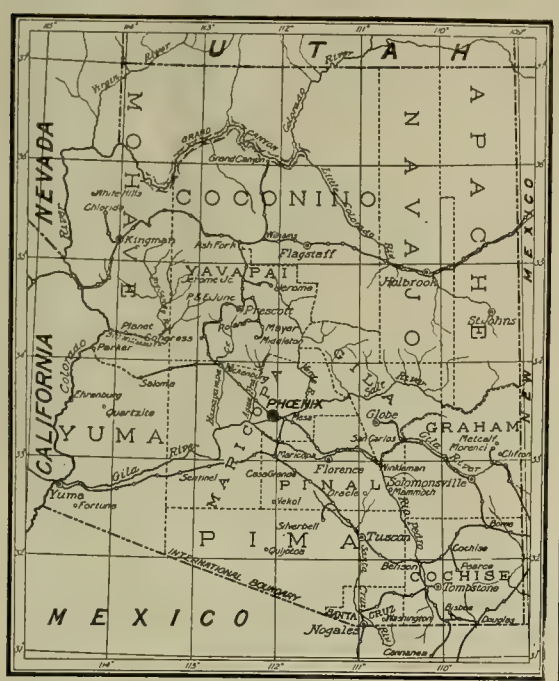
ARIZONA.

COCHISE COUNTY.

Work has been started on the group of lead claims, north of Dragoon, which Ben A. Williams recently sold to a company of El Paso business men. An incline shaft is being sunk on the vein.

GILA COUNTY.

(Special Correspondence).—The big deposit of copper ore being worked by the Miami Copper Co., of Globe, was increased this week by the finding of the same character of schist strongly impregnated with copper on the Miami mine 2500 ft. northeast of the Red Springs shaft. The strike was made at a depth of 570 ft., and while the schist at that depth does not carry more than 1½% copper, the


UTAH
NEVADA
COCONINO
NAVAJO
APACHE
YAVAPAI
YUMA
GRAHAM
PINAL
PIMA
COCHISE
MEXICO
CALIFORNIA
PHOENIX
Prescott
Flagstaff
Globe
Tucson
Tombstone
Nogales
Douglas
Bisbee
Clifton
Yuma
Kingman
Ash Fork
Holbrook
St. Johns
Jerome
Clarkdale
Verde
Miami
Superior
Florence
Casa Grande
Maricopa
Gila River
Salt River
Little Colorado River
Grand Canyon
Colorado River
San Carlos
Solomonville
Willcox
Benson
Fort Huachuca
Patagonia
Sonoita
Sasabe
Ajo
Gila Bend
Wickenburg
Parker
Needles
Congress
Mayer
Middleton
Humboldt
Chloride
White Hills
Peach Springs
Seligman
Williams
Winslow
Navajo
Fort Apache
Camp Verde
Fort Whipple
Fort Grant
Fort Bowie
Fort Huachuca
Fort Lowell
Fort Mohave
Fort Yuma
Fort Thomas
Fort Defiance
Fort Wingate
Fort Rucker
Fort Huachuca
Fort Grant
Fort Bowie

men are employed in the work. L. C. Heller is general manager.——A 12-ft. vein of ribbon quartz running from $6 to $7 per ton has been struck in the face of the drift at Ancho mine. The 10-stamp mill is running steadily. Austin Hart is superintendent.——The Champion Co. is defraying its operating expenses with the revenue from tributers. About 35 men are working.

Grass Valley, August 31.

INYO COUNTY.

An 'Exposition of Mineral Resources of Inyo' will be held at Bishop, October 13 to 16 inclusive. The committee, of which W. Gillette Scott is chairman, announces that it will be glad to receive specimens of ore representative of Inyo county and adjacent territory. Opportunity will also be given for the exhibition of machinery and other devices relating to mining.

SAN BERNARDINO COUNTY.

J. H. Reynolds, of San Diego, has been examining the Long Shot claim, at Hart, for a new San Diego company, recently promoted by A. L. Gottesburen. It is reported that Mr. Reynolds will advise his clients to not only proceed with the development of that property, but to also purchase the Bishop & Martin lease on block 3 of the Oro Belle No. 2. It is probable that hoists will be installed at both properties, and work started at once.——The Oro Belle and the Oro Belle Fraction claims have recently been surveyed for patent. The Oro Belle Mines Co., the owner of these claims, is being financed in Duluth, Minnesota. W. B. Andrews, who has charge of the sale of stock, reports that he expects to have sufficient funds to start work some time in October. The Company plans to spend about $30,000 in sinking a 300-ft. shaft and doing lateral work.

SISKIYOU COUNTY.

(Special Correspondence).—The United States & British Columbia Mining Co. has finally closed a deal with H. B. Wintering and F. H. Osgood for the Big Cliff group of claims on Russian creek, after allowing one option to go by default. The new owners have put a large crew of men to work and active development will be pushed.——A $10,000 pocket was discovered last Wednesday by Dan McCarthy, one of the best known and most successful pocket hunters in this county. The 'find' was made just half a mile from the old mining town of Scott Bar, the point where gold was first discovered in Siskiyou county away back in 1851. One piece of the honey-comb gold found in the pocket weighed five pounds. It was at Scott Bar that the late James Lindsay found a $3500 nugget shortly after the first discovery of gold in the district.——The Klondyke mine on Ash creek has finished the installation of a 75-ton Huntington mill and are waiting for the Siskiyou Electric Power & Light Co. to extend its line down the Klamath to begin milling.

Yreka, August 29.

TUOLUMNE COUNTY.

Contracts for construction of two adits, each 100 ft., in the Jumper has been awarded to J. A. Keyes.——The Garfield, lately named the Georgiana, near Carters, sold by Sheriff Sweeney to satisfy a judgment in favor of E. M. Carr and against the Floyd Mining Co., has been redeemed by J. L. Gibbs.——Peter Nave and William Musso have bonded their quartz mine at Italian Bar to a syndicate of Santa Barbara capitalists, the consideration being $20,000.——The Soulsby shaft has been equipped with transformers and will be run by electric power in the future. The Soulsby is owned by the Bagdad-Chase Co., which has a lease on the Ralph mine. At the latter property a hoist has been installed and eight men are sinking the shaft.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—A rich strike was made this week in the property of the Lincoln Mtn. M. & M. Co., operating on Lincoln Mtn. At a distance of 1200 ft. from the entrance of the adit a blind vein was intersected, a body of ore being uncovered that is from 4 to 6 in. wide. Assays run from $500 to $700 per ton in gold. The discovery came entirely as a surprise and considerable interest is being manifest among owners and operators of properties in that locality. The adit was started for the purpose of cutting the 500-ft. level of the Virginia City shaft, the objective being yet 200 ft. distant.——The Capital M. & T. Co. started work this week in the construction of a sampling and assay building. It has been decided that hereafter all ores from both the mine and mill shall be thoroughly sampled before being sent to the sampler. By working along these lines there will be little trouble in separating the mill ore from the smelting material. The average grade of the concentrate now being sold is 10 oz. gold and 6 oz. silver per ton. The smelting ore brings returns running from $275 to $305 per ton in gold. R. C. Patterson has been appointed to the position of mill manager.——A number of Pittsburg, Pa., capitalists were in camp this week and it is stated that work will soon be started upon the Hall adit. The bore will be driven ahead, while driving is to be put under way upon a number of veins already intersected. B. J. O'Connell, of Georgetown, is manager.——Work was resumed this week upon the Merrimac group of claims, situated on Kelso Mtn., West Argentine. The adit, now in 152 ft., is to be driven steadily forward for the intersecting of the series of veins owned. From surveys the Merrimac vein will be reached in 50 ft. High-grade ore was mined in the shaft workings, but as work could not be carried on during the winter months, it was decided to drive an adit. J. T. Johnson, of Denver, the owner, purposes driving the adit for 600 additional feet.——The Ruby Argentine M. Co., operating in the Peru district, is centering operations on the Calla adit, the bore now being in 700 ft. Within a short distance the Calla vein will be reached and from that time forward lodes will be intersected frequently. Ample finances are at hand to insure continued work. Rees C. Vidler, of Denver, is manager.——Work has been resumed upon the Pineo group of three claims, situated on Alpine Mtn. The adit, in 250 ft., is to be driven forward. Scattered mineral is showing in the breast, while a cross-lode will be reached within 50 ft. Jos. Raymond, of Georgetown, is owner.——Report is in circulation that operations on no small scale are to be put under way upon the Big White mine, situated on Green Lake Mtn. This property was an early-day producer, but owing to litigation resulting over the death of one of the owners it has lain dormant for 15 years. John McCluskey, of Denver, one of the original owners, was in camp this week and visited the property for the purpose of making an examination to determine if possible where the original discovery-holes were sunk. He has now submitted his report, having in a measure been successful. Some of the holes were sunk as early as 1864. The property lies a short distance to the west and across the gulch from the Colorado Central-Aliunde mines.——Shipments are being made from the Shively, situated on Brown Mtn. Since the streak of ruby silver was uncovered six weeks ago, a drift has been run for 45 ft. with the orebody still in evidence. Stoping is to be started soon, at which time the output will be increased. The initial mill-run brought 758 oz. silver per ton. B. J. Martelon, of Silver Plume, is manager.——The Bonham adit is being extended into McClellan Mtn., but, owing to the character of the rock, progress is slow. A lode was recently intersected, and after driving 55 ft. the hanging wall has not been reached. Occasional streaks of rich ore are found running through the vein matter. M. Bonham is owner.

Georgetown, August 29.

LAKE COUNTY.

It is believed that the Iron Silver Mining Co. is to erect a $12,000 ore-house at the Tucson and also resume operations at both the Moyer and North Moyer properties. Fremont Woodruff and H. G. Stevens, of Detroit, were in Leadville last week and it is believed that their visit was for the purpose of completing the details. A. S. Sharp is making extensive preparations for activity on the Ruby property in Weston pass, upon which he recently took a lease. Mr. Sharp will continue as superintendent of the Aurora in

Iowa gulch.——The Central Colorado Power Co. expects to have the transmission line complete between Shoshone and Leadville before the first of the year. This will enable mining properties in all parts of the district to equip with electricity. Many have been waiting for such an opportunity.——A force of men is at work dismantling the old Forest Queen property on Breece hill. This old mine is now being worked through Yak tunnel, and the surface plant is no longer necessary. The Forest Queen continues to produce some good lead ore. The operations through the Yak have been successful in every way, and later, it is figured, this property may be more extensively worked.

OURAY COUNTY.

Excavations have been started for the pyritic smelter on the Saratoga, near Ironton. In a comparatively short time the plant of machinery will be on the site and the work on construction begun at once.——W. S. McCarthy and E. C. Bacon have secured a lease on the Poland claim on the western slope of the Engineer mountain range, up the Uncompahgre, and the work of cleaning it out has begun. It is the expectation of the lessees that they will be able to ship good ore from the property immediately. Several cars of high-grade silver-ore were shipped out of the Poland years ago and some of the vein is still exposed.——Within a few days following the installation of the new machine drills, the Koehler tunnel, one of the largest enterprises on Red Mtn., has been closed down and the men discharged. While the cause of the abandonment of the project is a matter of dispute, it is asserted that in a short time the work will be resumed.——George Crawford arrived in Ouray and Red Mountain last week and has paid off a part of the indebtedness of the Red Mountain Railway Mining & Smelting Co., and it is believed the properties of that company will be started soon.

SAN JUAN COUNTY.

The Wyoming, on Engineer Mtn., is working a force of 12 men, who are engaged in sinking a shaft on a vein of high-grade ore, samples of which assay 1 oz. gold and 1900 oz. silver per ton. The Wyoming is owned by the Pittsburg Mines & Metal Co. and has ample capital for the development.

TELLER COUNTY.

The foundations for the 10-stamp experimental mill which the Portland is building, at Cripple Creek, are practically completed. The plant is being built to sample the ores of the mines and also about a million tons of dump, which it is estimated will run $3 to $4.50 per ton. The experimental plant will be under the direction of G. M. Taylor, who is superintendent of the Company's mill at Colorado City.——Bender and associates have been forced to quit work on their lease on one of the blocks of the Strattons Independence, on Battle Mtn., on account of a big cave-in which occurred recently. About 1000 tons of waste has covered a considerable amount of smelting-grade ore already sorted in one of the stopes. The mineral was being broken from a junction of four veins. The lease sidelines the Portland property.——A new shaft is being sunk from surface on the Ivanhoe claim, of the Greater Gold Belt Mining Co., on Gold hill near Badger station on the High Line Electric road. The new shaft is situated at the base of the dump of the former main shaft, these workings having caved.

IDAHO.

BLAINE COUNTY.

(Special Correspondence).—The Croesus, belonging to the Croesus Gold & Copper M. Co., is in a granite formation, and is situated four miles west of Hailey. Most of the other mines of the Wood River district are in limestone. On the Croesus group the granite is considered a cap-rock, overlying the lime. The Croesus has been worked with a varying degree of success for a number of years and has been regarded as strictly a gold mine; but within the last year or two a lead vein was discovered at 600-ft. depth. The gold vein, which has been opened by an 800-ft. vertical shaft, strikes east-west through granite and stands in almost a vertical position, though there are some variations in dip on different levels. This vein ranges in width from 20 to 60 ft., the vein filling consisting of quartz, granite, and porphyry, carrying gold and silver associated with iron and copper sulphide. The richer ore is found in shoots next the walls, there being low-grade ore and nearly barren streaks in the central part of the vein. The lead vein is also nearly vertical and has a strike that diverges but little from an east-west course. The two veins join near where the shaft was sunk and appear to run side by side, between the same walls, from this point westerly. The extensive work on the lead vein at the 600, 700, and 800-ft. levels shows it to be a strong vein, carrying high-grade galena and silver ore, accompanied by $7 to $14 gold per ton. A concentrating mill is being erected that will have the capacity of 150 tons of ore per day. Its equipment consists of crusher rolls, jigs, Huntington mills, amalgamating plates and tables. The plan is to mill the ores from the two veins separately. The plant is expected to be in operation within 60 days, electric power to be used. The equipment is nearly all on the ground ready for installation. A new air-compressor is to be installed at the mine, capable of operating 12 to 15 drills. It will be belt-driven, electrically operated. The hoist is operated by steam power. It is intended, however, to do the hoisting by electric power some time later. Sam E. Rigg, one of the principal stockholders in the Croesus company, is general manager, R. J. Scoble being the mine superintendent.

Hailey, August 26.

IDAHO COUNTY.

The Golden Crown mining property, owned by George S. Young, of Elk City, will start at once sinking a shaft. Ore showing free gold has recently been struck in an adit in only 60 ft.——It is said that a 20-stamp mill will probably be built on the Penn-Dixie. S. R. Gayton, of Bradford, Pa., has recently made an examination of the property.——The Graham Ross Co., which has a bond on the Anaconda mine in the Newsome district, has been reorganized and will be known as the Nevada Green Hill Consolidated Co. The new Company will resume work at the Anaconda mine within two weeks. An adit on the property is already in 1070 ft., and a cross-cut, started at 1050 ft. from the portal, is 70 ft. long.——The Gold Point Mining Co. has ordered a 40-ton Chilean mill for its property on Red river. The plant is due at Stites September 20. O. L. Smith is manager.

SHOSHONE COUNTY.

(Special Correspondence).—Many features of interest have marked the progress of the mining industry in the Coeur d'Alene throughout the past week, of which perhaps the most encouraging were the increased dividend disbursed by the Hecla mine, at Burke, and the announcement that the Stewart mine, at Wardner, is to resume work. Throughout the recent depression of the metal markets the Hecla mine has been paying dividends at the rate of one cent per month, except for a month or two, in which the property has been closed down. The dividend for August, however, has been declared at the rate of two cents per share, and involves the disbursement of $20,000, making a total disbursement for this year of $90,000, and a grand total of $1,610,000.——E. J. Carter, one of the heaviest stockholders of the Stewart Mining Co., has made the announcement that the affairs of the Company, which have been considerably tangled in a legal direction, are about to be straightened out, and operation of the mine and mill resumed. This will be one of the most important events of the Coeur d'Alene this year. The mill is practically new, with a capacity of about 150 tons per day. Big bodies of ore have been opened in the mine, and just after the completion of the mill several shipments were made to the East Helena smelter, of the American Smelting & Refining Co.——F. Cushing Moore, of Wallace, has been selected by the Republican party as the candidate who will make the race on the State ticket for the office of State Mining Inspector.——The 1900-ft. adit of the Springfield Mining Co. has struck the vein at a depth

of 500 ft. under the upper adit and about 700 ft. from the surface. The lead at this point is about 22 ft. wide, and on one side of the adit carries six inches of good copper ore, and two feet of the same ore on the other side. No assays have yet been made.——Sinking is to be resumed on the property of the Anchor mine, at Burke, on which the recent sensational strike of ore carrying all the way from 2000 to 4000 oz. silver per ton was made. The mine was closed down temporarily, pending the installation of electric power for the compressor. It is intended to sink the present shaft to considerable depth and then to drive on the lead.——The stockholders of the Mineral Farm property, near Mullan, have been asked to vote on an assessment to be levied by the company. This assessment will be either at the rate of three mills or of five mills per share, according to the vote of the majority. Accompanying the ballot sent to each shareholder of the company is a full report of the workings of the mine. The principal purpose for which this assessment will be levied will be the driving of an 1100-ft. adit and the sinking of a 250-ft. shaft. The company estimates that the cost of this work will be in the neighborhood of $30,000, which will also cover the cost of a full equipment of machinery sufficient for all present purposes.——A report which appears to be well founded is in circulation, to the effect that the Lacasse placer mining property, on Cedar creek, has been purchased by a syndicate of Kansas City capitalists. Among those

Phoenix Mill of the Keweenaw Copper Co.

who recently inspected the property are E. H. Keinzle, J. H. Neff, Harry Evans, and Harry Duke, all of Kansas City. Bids are being asked for mining and dredging machinery to be put on the ground without delay. It is claimed that the property is easily dredgeable and that every cubic yard of ground now being handled is yielding a return of 70c. to $1. No statement has been made as to the monetary consideration involved in this deal, but it is understood that a company of the gentlemen interested will be formed at Kansas City at once. The Lacasse Bros. will continue to manage the property.——A contract for 300 ft. of adit work has been let to James Backlund, on the property of the West Hecla Mining Co. The adit has already been driven about 1000 ft., but it is calculated that it will have to be extended from 150 to 200 ft. farther to reach the main lead. Arrangements will be made in the near future for the installation of six drills. It is believed that the Company has the lead of the famous Hecla mine.——Excellent reports continue to come from the property of the Clearwater Mining Co., in the Clearwater district. A large amount of machinery has recently been put in at this property, and work is about to commence at once in the sinking of a double-compartment winze from the lowest adit. This property has been developed by means of three adits, in all of which a good showing of ore has been made. Assays of this ore run all the way from 12 to 33% copper, and some gold. Up to the present time the property has been handicapped by want of transportation facilities, but a movement is afoot among the different mine operators of that district to petition the county commissioners for the construction of a 45-mile wagon-road to give access to the Chicago, Milwaukee & St. Paul railroad.

Wallace, August 29.

MICHIGAN.

HOUGHTON COUNTY.

(Special Correspondence).—The Keweenaw has recently started operations at its Phoenix mill. The first ore to be crushed was a part of the 60,000-ton stock-pile which has accumulated at the mine. Although the mill is equipped with but a single head, with a capacity of about 300 tons per day, it will suffice until the completion of the new mill, which the company plans to erect at the mouth of the Montreal river, on Lake Superior. In addition to the head mentioned, the mill equipment comprises 16 jigs, 12 of which are of the Cleaves design, while the remaining four are of the Woodbury type. The rehabilitation of the mill, which has been in progress for the last six weeks, has resulted in the installation of entirely new and up-to-date machines. At the mine the improvement in the lode is very noticeable as depth is attained. The shaft is at present bottomed at the 13th level, a depth of 1125 ft., where the lode shows a width of 11 ft. Since the opening of the mill all attention has been centred upon stoping of the laterals. There is at present about two miles of openings in the Medora shaft, and on all sides are evidences of the unmistakable richness of the ground. The third level, which extends at present for a distance of 1900 ft. east and west, will be continued west for a distance of 1200 ft., at which point it is the intention to sink a second shaft. Pits

Quincy No. 2 Shaft House Which is Being Replaced by a Steel Structure.

have already been sunk through the overburden for a distance of about 15 ft., and sinking and blasting will be again taken up.——Work on the new steel shaft-house at No. 2 shaft of the Quincy is progressing rapidly, and already the framework is nearly completed. The huge wooden structure which has served for years will be entirely dismantled and the crushers and other machinery transferred to the new house as rapidly as the latter is ready to receive it. The Quincy already has two steel shaft-houses at the extreme northern and southern portions of its property, which comprises a total of 1320 acres. The Mesnard shaft, on the north, has reached a depth of about 4500 ft., and has pushed its working laterals into the 800-acre tract purchased from the Arcadian two years ago. It is through this shaft, and a new one which is at present designtaed as No. 9, that the company expects to explore the Arcadian lands. The new shaft is situated about 2800 ft. west of the Mesnard. An old shaft, sunk by the Clark people in the early days, will be enlarged to three compartments and deepened. The temporary equipment consists of a boiler and a small hoist, air being supplied by a pipe-line from No. 8 shaft. The permanent equipment has been ordered and will be on the ground in due time to facilitate the sinking.——Kearsarge No. 4 shaft of the Osceola Con. Mining Co. has reached a depth of 250 ft., from which point a cross-cut is being driven to the lode. The method employed in sinking this shaft differs from the customary way, in that, instead of sinking the shaft directly in the lode and running the drifts into the shaft from opposite directions, the shaft is put down in the foot-wall, independent of and parallel to the lode. Cross-cuts are driven at suitable intervals (100 ft. or more) to the lode, and from these the drifts are run, as in the old method, parallel to the strike of the lode; the

shaft in the latter case is only connected indirectly to the drifts by means of the cross-cuts. By this means the shaft is protected by the hard rock of the foot-wall from any accidents, such as a cave resulting from falling hanging wall or quantity of lode material.

Houghton, August 29.

NEVADA.

ESMERALDA COUNTY.

Between 3000 and 4000 tons of ore on the Begole dump on the Consolidated has been purchased by the Nevada-Goldfield Reduction Co. The price paid is not made public. This dump rock will be used to 'dilute' the high-grade ore purchased by the Company and worked in its local stamp-mill.——Work has been resumed by the Midnight Pawnee Mining Co. on its property in the Diamondfield section of the district. A cross-cut is being run on the 400-ft. level to pick up the Black Butte lead.——Work was begun last week by the Little Goldfield Mining Co. on its long-term lease on the Goldfield Souvenir estate. The Company will also develop its fraction adjoining.——The Goldfield Apex Mining & Leasing Co., recently financed by Frank P. McNeill in Salt Lake City, has started work on the lease which it holds on blocks 9 and 10 of the Golconda. The property is equipped with machinery and has a shaft down 150 ft. The first station will be cut at 300 ft. and the shaft will be continued down to 500 ft.——The Wonder King M. & L. Co. made its first shipment from its Rawhide property last week. It consisted of two lots of 15 tons each, one of which assays $361 per ton, the other being the general run of the vein, which assays $76.——John Franks, backed by Philadelphia capitalists, has secured a bond and lease on the Buster mine of the Lida Queen Mining Co., in the Lida district, and will start up the mill early in September. He has opened up two shoots of ore in the south vein. He will put up a hoist and sink the inclined shaft deeper.——The mines of Goldfield produced during the week ending August 29 a total of 2388 tons estimated to be worth $178,520. During the same period the Tonopah mines produced 6675 tons of an estimated value of $178,425.

NYE COUNTY.

Since sinking was resumed in the Mizpah shaft, at Tonopah, the management has changed its plans somewhat. It was the intention at first to send the shaft down to the 1300-ft. point and start extensive prospecting work from that point, but it is now thought advisable to continue sinking until the shaft is down 1500 ft. and start the prospecting work on that level. During last week the shaft was lowered 18 ft., the bottom now being down 1140½ ft., showing no change in the formation, which is rhyolite dacite.——The pipe-line from the Tonopah Extension power-house, which was to furnish air for power to run additional machine-drills in the MacNamara mine, has been completed and four additional drills were set to work last week. This makes eight machine-drills in operation in this property, half of which are working in ore, the balance on development work. During the past week four carloads of ore, averaging 50 tons each, were sent to the smelter, and three carloads to the mills, making the total week's shipments 350 tons.——Milo Plemenaz, of Manhattan, will purchase a hoist for the lease which he holds on the Litigation Hill.——The first shipment of bullion from the new 25-stamp mill at the Homestake-King Con. property was made last week. It consisted of three bars weighing a little more than 77 lb. Troy, estimated to be worth about $17 per ounce.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—A steam-hoist has been received at Danville, for the Lucille Dreyfus mine.——The machinery for the Knob Hill Mining & Milling Co. has been received and is being installed.——The Silver Leaf has shipped a load of silver-lead ore from Covada camp to Rickey Rapids, a steamboat landing on the Columbia river, to be transferred to the Great Northern railway at Myers Falls, in transit to the Everett smelter, on the Pacific coast. From bucket samples this ore is estimated to assay over $100 per ton.——A steamer has been put on the Columbia river, to run regularly to Rickey Rapids, which will give cheap transportation to the Covada mines and stimulate development.

Republic, August 28.

STEVENS COUNTY.

(Special Correspondence).—At the First Thought mine two new piers have been added to the aerial tramway. During July, 31 cars of ore were shipped, exceeding the shipments for the month of April, during which more ore was shipped than during any month in the history of the mine.——At the First Thought Extension camp living quarters have been completed and the mine is now under active development. Great results are expected from this property.——Foul air in the Orient, and also in the Copper Butte mine has compelled the miners to work on short shift, and the managers are planning for the best means of ventilating.——So much shipping ore has accumulated in development of the Globe mine that the company has decided on building ore-bins, which are now in course of construction.——Additional funds have been secured for the Trojan mine, and a gasoline engine, blower, and additional pipe have been ordered. Work on the long adit will be resumed as soon as the new equipment arrives.——At the Trophy mine a contract for 100 ft. on the adit has been finished. The adit is now in 318 ft. At a stockholders' meeting of the Trophy G. M. & M. Co., recently held at Orient, H. L. Schermerhorn and H. D. Trunkey, of Spokane, Wash., and James T. Dolan, C. E. Legg, and A. A. Anderson, of Orient, were elected directors. The executive officers are J. T. Dolan, president; C. E. Legg, treasurer; R. O. McClintock, of Spokane, secretary.——Sensational strikes of free-gold ore have been reported from the Beecher mine. The working force has been increased, and ore is being sorted. As soon as sacks arrive they will be filled and the first ore from the property, under the present management, will be shipped to the smelter. John Gilpin is superintendent. The mine has been thoroughly sampled by R. M. McEntire, consulting engineer, and the company, confident that the mine is on a dividend basis, has resolved on withdrawing the sale of treasury stock. It is believed the returns from the first carload will go a long way toward paying for development and additional equipment.——At the Second Thought mine the shaft, at a depth of 25 ft., has struck the vein, and the ore is found to be identical with the First Thought ore, and only 500 ft. distant from the latest strike in the First Thought mine. The First Thought vein runs 800 ft. through the adjoining Second Thought ground.

Orient, August 26.

CANADA.

BRITISH COLUMBIA.

Coke supply for the Boundary smelters is still an uncertain quantity, resulting from the recent crippling by fire of the shipping facilities at the Fernie ovens.——The smelter and mines of the Dominion Copper Co. have now been tied up for nearly three weeks for lack of fuel. The Company arranged for a supply of coke from the coast, but through delay of the Canadian Pacific railroad it has not arrived.——The Granby smelter has been operating five furnaces during the past week, but coke has been consumed sparingly. Interviewed in Spokane, Jay P. Graves, general manager for the Company, denied any possibility of the plant shutting down. When assured of sufficient coke the Company will operate at regular capacity again.——The Snowshoe property has not resumed as yet on account of the uncertainty of the coke situation, but instructions to begin operations are now being expected daily.——The only mining company in the Boundary not affected by the coke shortage from the Crow's Nest Pass is the B. C. Copper, whose ore shipments and smelter treatment for the past week ranged around the high-water mark. Coke for B. C. Copper comes from Coleman, Alberta, and the shipments were not interfered with by the recent Pass fire.

Special Correspondence.

JOHANNESBURG, TRANSVAAL.

Retrenchment at Kimberley.—A Diamond Rush.—June Working Costs on the Rand.—Brakpan's Rich Strike.—Gold Law Committee.—Geological Controversy.—Metallurgical Trials.

The industrial gloom prevailing throughout South Africa has been intensified by the closing down of the De Beers mine, in speedy succession to the Dutoitspan. The actual number of white employees retrenched in consequence of this further curtailment of the operations of the Consolidated is 200, but the fact that these men and their dependents are leaving the town with small hope of speedy re-engagement, and that at least a year of comparative inactivity at the mines must prevail, has placed the town, so flourishing a year ago, in a position of critical distress. The situation is the more deplorable in view of the Rand's inability to absorb Kimberley immigrants in search of work, and there will be another batch of recruits to the army of unemployed. Many of these are certainly men of good character and capabilities, willing to turn their hands to anything.

As a mild, though wholly inadequate, set-off against the distressful closing down of the De Beers mine, we have experienced a small measure of hopeful excitement in the proclamation of new diamond-diggings in the district of Barkly West. It is estimated that as many as 800 took part in the rush; upward of 500 claims (60 by 30 ft.) were pegged by holders of a digger's license, permitting each to take up one claim. Some of the stones won in this district are of the finest quality, and it is most sincerely to be hoped that the peggers will be able at least to maintain themselves upon the field until more beneficial and less precarious avenues of employment can be found.

The detailed analysis of the June gold production, now issued by the Chamber of Mines, shows that, on a tonnage milled of 1,458,499 tons, Rand working-costs averaged 18s., and the yield 35s. 6d., allowing an increased working profit of 3d. per ton. The most notable companies from the standpoint of low expenditure were, in June, the Robinson, with costs at 12s. 9d. per ton (slightly increased owing to temporary misfortunes), the Simmer & Jack, 13s. 1d., the Robinson Central Deep, 13s. 6d., Geldenhuis Estate, 13s. 10d., Glencairn, 13s. 11d., and the Knights Deep, 14s. The achievement of the last-named property, which had costs three years ago among the highest on the Rand, with 4s. for pumping alone, is especially remarkable. One of the Eckstein Central Administration mines, where the costs remain comparatively high (21s. 6d.) is the New Modderfontein. W. W. Mein, now general manager of the group, has appointed his former mine-captain of the Robinson (G. Hussey, of the United States) as manager, no doubt with a view to introducing the methods of underground administration which have raised the mining efficiency of the Robinson to so high a level. It must be noted, for those consequently tempted to compare the fortune-costs upon the two mines, that the New Modderfontein reefs are narrower, and that the new manager will probably not find himself in control of miners of the proficiency of those at work in the Central Rand.

A few years ago reports of bore-hole strikes or other notable developments in the Far East Rand were of monthly occurrence, but lately we have had our attention absorbed by two or three special points of interest. Diamond-drilling has ceased and the more conclusive and satisfactory operations of mine development constitute the line of activity followed. The property of the Brakpan mines has on this account risen to a position of great significance, for, from its vertical shafts is being proved an extensive area of deep-level ground, which is far from any developed mines, and covers a portion of the Rand basin, wherein the reef lies nearly flat, and is of possibilities but slightly determined. The No. 2 shaft of this mine, noted for the record-speed of sinking attained in it, reached its goal last week. At a vertical depth of 3695 ft. the reef (representing the series of the Central Rand) was reached and ore was found assaying 16 dwt. 4 gr. over a width of 81¾ in., a width quite phenomenal for this region. This valuation being obtained from sampling around a shaft 42 by 9 ft. in dimensions, is clearly of much greater importance than any of the bore-hole returns upon which it has been necessary to base estimates largely in the past. No. 2 shaft, in which the reef dips at an angle of 8°, is 4400 ft. on the dip of No. 1, which cut the reef nearly a year ago, and from which development results have lately been satisfactory, though not up to the high standard of possible return indicated by the new strike. The assay-values revealed in No. 2 form a fitting reward for what has been one of the most creditable pieces of work in recent Rand mining. A brief record of progress may be summarized as follows: The first sod was cut in May 1905; a hoisting engine was put into operation when 100 ft. had been sunk; the shaft was timbered with pitch-pine to 300 ft., and Tasmanian stringy-bark below; in April 1907, at a depth of about 1200 ft., a chamber was cut for a three-throw Gould electric pump; in July 1907, record-footage of 204 ft. was made, from 1690 to 1894 ft., at an inclusive cost of £22 19s. 9d. per foot; the average rate of sinking from 1894 ft. to the reef (3695 ft.), was 161 ft. per month. The shaft, of seven compartments, was sunk by hand-labor working three 8-hr. shifts, and one-ton buckets were used throughout.

As anticipated, the Gold Law has received a large share of Parliamentary attention during the new session and the many points of objection to the Minister of Mines' Bill, discussed frequently in the public press, have been raised in due course by members of the Opposition. It has fortunately been recognized that the future of the country depends to a large degree upon the conditions under which its mineral exploitation is to be advanced, and that consequently such important questions as open prospecting, compulsory working of claims, owner's rights, and the like must not be settled hastily under the influence of party politics. A select committee has been appointed to deal with the bill, comprising the Minister of Mines, the Colonial Treasurer, F. Drummond Chaplin, Sir Willem van Hulsteyn, and Mr. Jacobz.

A certain farm, Zwartkop No. 82, situated a few miles to the north of Krugersdorp, has been made to play recently a very prominent part in one of the great unsolved problems of Witwatersrand geology. Apart from the question of the origin of the Main Reef gold, which was resuscitated by Professor Gregory last year after two decades of intermittent debate, the most crucial riddle calling for solution is whether the Witwatersrand formation is younger than the northern boss of granite, from which the strata dip away to the south, or whether it is older, and has been intruded by it. Last week Mr. Draper, one of our oldest geologists, showed that his interpretation of Zwartkop, upon which a certain series of sedimentary beds is manifestly intruded by the granite, simplified the correlation of South African formations by eliminating the Swaziland beds as an independent series, and grouping them with the Lower Witwatersrand formation. This theory, in support of which unfortunately no indication of contact-metamorphism around the granite at Johannesburg can be adduced, would therefore suggest that the Rand formation dips north from the granite on the Pretoria side of the boss, though principally covered by younger rocks and beyond the scope of rational drill-prospecting. It is to be hoped that the triangular controversy over the Zwartkop beds will be carried to a more conclusive stage, and that we shall thus learn if it be necessary to modify the classification of Transvaal strata adopted by Hatch and Corstorphine in their standard work on the 'Geology of South Africa.'

The formation of the Metallurgical Trials Committee, to investigate new ideas and inventions on behalf of the indutry as a whole, or of those groups of mines desiring to participate in any experimental work, and which promises to confer great benefits upon operators by the prevention of duplication and by the encouragement of originality, has

so far met with success that the scope of investigation is likely to be extended beyond metallurgy. There is, indeed, no reason why similar attention should not be paid to novelties of pure mining and mechanical application, provided they promise to be of practical benefit to the subscribing members. The membership now comprises all the big groups of producing mines with the exception of the Goerty and Barnato administrations.

In the letter from Johannesburg, published on June 20, it was wrongly stated that no attempt was made to sort out waste rock at the Langlaagte Deep. As a matter of fact, in April that mine produced 37,971 tons of ore, of which 2760 tons was sorted out. This amounted to 7.27%. In July the reject constituted 9% of the gross ore-output.

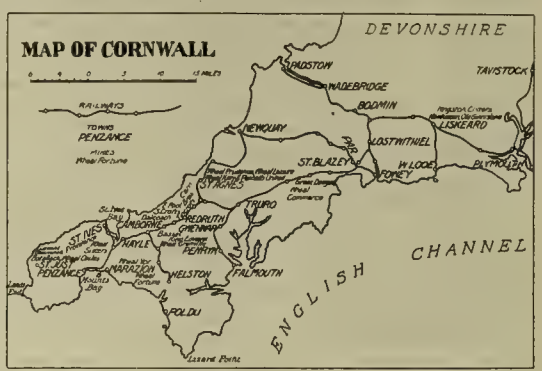
LONDON.

Central Chili Co.—Output and Prospects of Camp Bird. — Disastrous Effects of Low Price of Tin in Cornwall. — Concentration Problem at Dolcoath.—Carn Brea & Tincroft Mines, Ltd.

The Central Chili Copper Co. has not had a very prosperous life, and though the mine and smelter are in better condition now than they had been previously, the slump in copper has once more made the situation somewhat gloomy. The Company is a re-construction of the old Panulcillo company which was originally formed in 1864. In 1894 the mine was given up by its former owners as a bad job, but Mr. Goldschmid and his Paris friends decided to make another effort. For some years want of harmony on the board, and other matters of similar character which need not be raked up now, prevented progress being made. Small dividends were distributed in both 1900 and 1901, but later on further capital had to be subscribed. It was not until 1906 that the position was retrieved and the balance restored to the right side. A dividend at the rate of 5% per annum, absorbing £15,623, was paid out of the profits of that year. A working profit of £12,684 was made for 1907, but this has been extinguished by the provision for depreciation, so that nothing is available for dividend. A great deal of money continues to be spent in exploring the mine, and the facilities for conducting these operations are considerable. Very little luck attends the work, and the orebodies are apt to be lean. During 1907 the total ore raised from the mine was 20,341 tons, averaging 3.63% copper. In addition to this 22,798 tons were bought, averaging 6.78%. The total ore smelted was 42,300 tons, and the production was 1972 tons of fine copper, plus gold and silver worth £7557. The losses in smelting were considerable, being over 14%. Seeing that three-quarters of the copper produced came from purchased ores, and as we do not know the exact terms of the purchase, it is not possible to estimate how the price of copper affects the profits. Anyhow, £62,361 was paid for the 22,798 tons of 6.78% ore, and the average price obtained for the copper sold was £85 per ton. As only one-quarter of the copper sold came from the mine, the Company operates more largely as a custom smelter than as a copper producer. Several things require improvement yet, such as the provision of more accurate sampling apparatus, which will help to cut down the losses in smelting, and will also enable the Company to purchase ore more methodically.

The report of Camp Bird, Ltd., for the year ending May 1, 1908, has been looked forward to with unusual interest on this side by shareholders and others, owing to the official and unofficial news that has been circulated recently with regard to the prospects of the mine. For some time we have been told that the veins were decreasing in value as greater depth was reached, and that J. E. Spurr had been making an examination with a view to determining the chances of discovery of workable orebodies. Mr. Spurr has completed his underground survey, and is now engaged on a surface examination. His report has not been published, and very little is said as to its nature by Mr. Beatty in his report. All we are told is that Mr. Spurr has indicated an ore-horizon below which it will not pay to go. The engineers' report shows that in all the workings the gold content is decreasing rapidly. There is one portion of the mine in the higher levels where there is a good deal of virgin ground of promising nature, and, in future, exploring operations will be confined to this. Mr. Beatty estimates that the broken ore and the ore ready for stoping is sufficient to keep the mill going for two years or more, and to provide a mining profit of half a million pounds.

During the year 1907-8 the ore crushed was 80,087 tons dry, which yielded $1,963,839 gold, $68,545 silver, $38,375 lead, and $306 copper, being a total of $2,071,067, while the operating expenses were $685,332. Mr. Walsh took $340,883 as his share, and after allowing for a few small items, the balance of profit in London was £196,178. Out of this £164,000 has been paid as dividends, which is at the rate of 20% on the issued capital. The Company holds a large balance in hand, the amount now being carried forward being £131,453. Since the Company was formed in 1902, the total dividends have amounted to £943,000, being 115% on the issued capital. During 1906-7, considerable sums were spent out of revenue for the purpose of re-building the mill which was destroyed by the snowslide. The metals are won from the ore by amalgamation, by concentration of sulphides, and by cyanidation. About three-quarters of



the recovery is by amalgamation, 16% by concentration, and 9% by cyaniding.

The low price of tin has played havoc with the Cornish mines, and the half-yearly reports now being issued are not cheerful reading. The Dolcoath mine has made a profit of only £6295 for the first half of this year, as compared with £40,000 a year ago. The total receipts were £73,889, the working costs £62,611, and lords'-royalties £4784. The ore crushed was 48,849 tons, and the tin concentrate sold was 880 tons, which realized an average price of £81 9s., as compared with £120 11s. a year ago. During the last five or six years the amount treated and the recovery have been remarkably constant, and the sole factor in profits has been the price of tin. When I wrote of Dolcoath six months ago, I mentioned that the mine was once more becoming a producer of copper. For many years the low-grade copper ores found in certain parts of the mine have been untouched, waiting for some new metallurgical discovery that would make them valuable. These ores contain 2 or 3% of copper, and from 10 to 20 lb. of black tin per ton, and they were of no use as either a tin or as a copper ore. The Elmore vacuum-plant erected last year makes a very clean separation of the pyrite, and leaves the tin untouched to go in the tailing to the tin-dressing works. Progress with this plant has been slower than might have been expected, and as yet there is no income derived from the copper concentrate. I understand, however, that the plant is in nearly continuous operation, and that the product is being stored until such time as it may be sold to greater advantage than is possible at present. The directors recommend that no dividend be paid this half-year. This is good policy for two reasons: first, that no one knows how low tin is going, and, second, that additional money will be required for completing and equipping the new main shaft. The Company

is in a strong financial position, having cash and securities on hand amounting to nearly £60,000.

The Carn Brea & Tincroft Mines, Ltd., has been hit hard by the fall in tin, and has made a loss of £6133 during the period from January to June 1908. The loss during the second half of 1907 was £2931. During the years 1905-1906, and the first half of 1907, the prices of tin enabled the Company to make profits. The ore treated during the six months was 31,828 tons, yielding 457½ tons of tin concentrate which realized just under £80 per ton. The amount crushed, and also the yield, increased slightly over the average of the past ten years. Otherwise the losses would have been greater. In addition to tin, the Company also sold 81 tons of arsenical ore, and 4⅔ tons of wolfram. For some years the directors have been considering the advisability of re-organizing the workings and the plant, and it is a great pity that the opportunity was not taken a year or two ago when tin was booming. At the present time there is little or no chance of the necessary capital being obtained either in or out of the County.

MEXICO.

Re-opening of Monterrey Steel Plant.—Lead Production at Minas Viejas. — Smelting Plant of Penoles Mining Co. at Mapimi. — Discoveries at El Suerte, Mapimi District. — Plant of Mexican Con. M. & S. Co. at Guanacevi.—Conditions at Guanajuato.

Monterrey is unusually elated over the bright prospect for a long season of work at the steel plant in that city. Since its inception this plant has been able to work only at intervals, its capacity being considerably beyond the local demand, so that even people living in Monterrey never knew whether it was running or not. On June 2 the plant was again blown in, after a long period of idleness, the accumulation of stock having been gradually disposed of in the meantime. A large order for steel rails was obtained from the Mexican National railroad which it is understood will keep the furnaces in blast for a protracted period. This means much to the city of Monterrey. Added to the recent excellent showing in the San Pedro mines of the Mexican Lead Co., in the Diente district, near Monterrey, it gives a cheerful air to all business. At Villaldama, about an hour's ride on the Mexican National railroad north from Monterrey, the Minas Viejas, which were taken over a year ago by the Cia. de Minerales y Metales, being practically the same as the Peñoles Mining Co., of Mapimí, Durango, have again been opened up as an enormously rich lead-producer, while the old workings continue to turn out their usual large tonnage of zinc carbonate ore. The Peñoles Mining Co.'s smelting plant at Mapimí has been practically re-built in the last few years under the superintendence of H. S. Mulliken. An average of about 1000 tons per diem is being smelted, and the Company's own ores are such that it is forced to go into the market as an active buyer to obtain the character of ores needed for its 'mixes.' No 'cut-throat' competition is being entered into, however, as the management usually succeeds by trade to get from the other smelting companies the ores required. About eight kilometres from Mapimí, and three kilometres south of Ojuela, on Bufa Mtn., a rich strike of silver has been made on the surface of El Suerte, and its improvement with depth, taken in conjunction with the great strength of the Mapimí veins in general, has given great encouragement to operators in this new portion of the district. At Velardeña the mines and smelter of the American Smelting & Refining Co. and the American Smelters Securities Co., are said to be again running full-blast, though the mines are proving to be greater producers of lead than of copper, for which latter metal the new smelting plant at Verlardeña was primarily intended. Some lead stacks were erected in the beginning, however, and practically all of the A. S. & R. Co.'s purchases of copper ores are going to the Aguascalientes plant. The continued low price of silver has necessitated such a curtailment of production at Indé that less than 10% of the regular number of men are now employed. The Guadalupe and Terrible are the only mines of consequence operating at Indé. Although these are gold mines, they have materially cut down production. At Guanaceví the Mexican Consolidated Mining & Smelting Co., which recently purchased the Soto and Porvenir, is rapidly completing its 150-ton cyanide mill for handling both ores and old tailing. The latter will more than pay for the cyanide plant, and when these are cleaned up the concentrating mill is to be enlarged from an 80 to a 150 or 200-ton plant. The Boca del Cobre Mining Co. has ordered new machinery, compressors, drills, and other equipment, from Denver. When erected, the work will be pushed and production materially increased. Production during development of this mine while under option paid almost half the purchase price of the property.

Guanajuato reports a weekly production of ₱165,000 in bullion and ₱95,000 in ore and concentrate, or at a rate of nearly ₱15,000,000 per year at the present price of silver. The continued low market, however, is putting even these large producers on the anxious seat, and it is a question whether they will continue work if there is not prompt improvement. Three years ago, with production less than one-third what it is at present, the profits were really greater. At the Sirena mine the Guanajuato Consolidated Mining & Milling Co. has just completed the installation of a 200-kw. rotary converter of the Westinghouse Electric & Mfg. Co., from which the various mine-motors are supplied, as well as the electric locomotives that haul the ore around the mountain from the mine of La Sirena to the mill of San Francisco (La Hacienda de San Francisco de La Pastita, as it is locally known). The new equipment as it was shipped, weighed 15 tons.

BUTTE, MONTANA.

August Copper Production. — Repairs to Boston & Montana Smelter.—Re-organization of Heinze Companies.—Butte & Buxton.—Pittsburg & New York Working Umatilla Gold Mine. — Stevens' Copper Prophesies.—Butte & Montana to Resume.

In August the Washoe smelter at Anaconda, the Butte Reduction Works, and Pittsmont smelter at Butte, turned out about 26,121,000 lb. copper, a little less than was produced in July, due to the fact that the mines were shut down for one day, and the smelter output was slightly restricted. It is noticeable that the average yield of copper per ton has been greatly reduced, and that the ore-tonnage has increased. This has been made possible by the better market for copper. The ore shipped by the different companies averages in copper about as follows: Boston & Montana Co., 76 lb. per ton; Anaconda, 62; Butte & Boston, 66; Washoe, 64; Parrot, 58; Trenton, 56; North Butte, 94; Butte Coalition, 80; Original, 90; Pittsburg & Montana, 95. To the totals of ore produced, and copper turned out, the various companies contributed as follows to the August production:

Companies.	Tons ore.	Lb. copper.
Boston & Montana	48,000	3,648,000
Anaconda	128,000	7,440,000
Butte & Boston	21,000	1,386,000
Washoe	15,000	960,000
Parrot	13,500	783,000
Trenton	14,250	798,000
North Butte	42,750	4,018,500
Butte Coalition	27,000	2,160,000
Original	40,500	3,645,000
Pittsburg & Montana	6,000	570,000
Miscellaneous	7,500	712,500
Totals	355,500	26,121,000

The Boston & Montana smelter at Great Falls, which has been closed for three months on account of damage by the June flood, is gradually being restored to commission, but will not be running at full capacity for several weeks. Operations have been resumed in the concentrator and reverberatory departments. Due to work still going on at some steel structures, and on a new flue in connection with

the blast-furnace department, that part of the plant has not yet been started. A force of about 700 men was necessary on the repair work during the past three months, indicating the great damage that was done to the smelter. The work consisted in re-building the walls of the head-race, removing a vast amount of earth and rock that had been deposited in the tail-race, repairing the power-house and filling in a large portion of the smelter-grounds which had been washed away.

That F. Augustus Heinze is making progress in re-organizing his companies and in re-habilitating his fortunes is indicated by the reports of the re-organization plans of the Ohio Copper Co., the Bingham Co., and the Davis-Daly Estates Copper Co. It is also announced that the affairs of the Stewart Mining Co. are in a fair way of settlement, and that there will be a resumption of work at the mine and mill in the near future. Butte stockholders of the Davis-Daly Co. have received notice of a special meeting that will be held in New York for the purpose of perfecting the re-organization of that Company. The new Company is to be known as the Davis-Daly Copper Co. and will have a capital stock of 600,000 shares, 70,000 shares less than the old company. The old stock will be exchangeable for new upon payment of a $2 assessment. The new stock has a par value of $10 per share; the old was $15 par, and was underwritten at $12.50. The new stock will therefore cost the subscribers $14.50 on the old basis of subscription. The new underwriters are to get $180,000 for their services, and it is expected to raise $1,200,000 for the treasury, with which to pay the Company's debts, the underwriting commissions, and to provide a working fund which, it is hoped, will be sufficient to place the Company on a paying basis. There is mention that the vendors are to turn into the new Company some additional property not included in the old deal, but in Butte there is no information about this additional property, unless it be the Daly property on which the vendors hold unpaid options. But the title, of course, remains with the original owners. The vendors were supposed to be liable for the deferred payments, and the stockholders had that notion about the relations between the Company and the vendors; but it now appears that there is a substantial controversy over the question, and the vendors will make good by turning over some additional property-interests, consisting of a quarter interest in the Davis estate mining property and in city lots. The debts of the Company aggregate about $400,000, including $300,000 in incumbrances on property, unpaid options, and about $100,000 in a floating debt. After paying all obligations, the Company expects to have a fund of about $700,000 for development work, if it is successful in collecting the $2 assessment. The old Company has already spent about $600,000 in development work and equipment. Reports of a great strike of 12% copper ore and a vein full of it in the Original cross-cut were persistent last year, and despite denials from reliable sources the falsehoods were spread and believed. Lately there have been more reports of big strikes in the Colorado mine which have not been made. Several veins have been cut, and they contain good ore, but not in commercial quality or quantity. Of all the properties owned by the Davis-Daly, the Colorado is most likely to develop into a copper producer. The big 'strike' in the Lizzie, so flashily and persistently reported last year, has 'petered' out, and the lessees who made the strike had to abandon their lease because there was no more ore in the vein and the ore in the other vein did not pay for mining.

Horace J. Stevens, of Houghton, Mich., was in Butte for a week to familiarize himself with present conditions and changes in the mining situation. He inspected the mines of all the big companies and is especially enthusiastic about the showing of the North Butte and Butte Coalition mines. He also visited the new Buxton district, 12 miles southwest of Butte, where the Butte & Buxton Co. is preparing to do exploration on the theory that the veins of the Butte district extend to that part of the country. Butte mining men are much interested in the progress of the Butte & Buxton, as hundreds of claims have been located in the new district, and the results of development work are eagerly awaited. The Butte & Buxton will sink a 1000-ft. shaft, starting from an adit which is 700 ft. long. A raise will first be made to the surface, a distance of 130 feet.

The Pittsburg & New York Copper Mining Co., which owns a group of undeveloped claims south of Butte, has branched out into gold mining, and has taken over the Umatilla group of claims eight miles from Helena, which includes a small stamp-mill and cyanide plant. After a small amount of development work had been done a rich shoot of ore was opened at a depth of 70 ft., assays going as high as $700 per ton. Five stamps have been put to work on ore, and the cyanide plant will be started shortly. There are thousands of tons of tailing to be treated that assay from $4 to $14 per ton.

That copper conditions are gradually improving, and will get much better before the close of the year, is the opinion of Horace J. Stevens. "The metal price is certain to go much higher, and, as usual, the Frenchmen and the Englishmen are making the profits," said Mr. Stevens. "They are wise enough in Europe to know when copper is cheap, and they buy it. They have a lot of cheap copper on hand there now, but not nearly so much as the copper 'bears' would have us believe. They are not selling or using that copper, but are continuing to buy at present prices to supply their needs. They will continue to do that until the price gets too high again, and then they will stop. It seems to be the case with consumers in this country that when the price of copper goes down to a point at which it can not be produced they will stop buying, and they believe copper will never be used again in large quantities. So they don't buy till prices go up, and then they purchase all the way up, and the higher the price the more copper they want. Copper will always be in demand, as it always has been, and nothing will ever take its place."

A telegram from New York announces that the option on a majority of the stock of the Butte-Montana Co. has been taken up and it is expected that work on the property will be resumed in six weeks or two months. There is so much said about Butte-Montana that very little reliance can be placed in any new announcement. The Company has always been the object of some over-zealous boosters and stock manipulators. It has a good property in the Alex Scott claim, which lies in the heart of the Butte producing mines, adjoining the Colusa of the Boston & Montana Co. It is developed by a good shaft and several levels and some good ore has been opened, but not in large bodies.

The troubles of the lumber men, which threatened to involve the Amalgamated Copper Co. with the miners' union again, are in a fair way to settlement. The striking lumbermen at Hamilton and St. Regis will be taken back and their grievances will be taken up later and adjusted. The manager of the Amalgamated and lumber interests had several long conferences with the miners and other union representatives.

SALT LAKE, UTAH.

New Furnaces at Garfield Smelter. — Disposal of Concentrate by Boston Consolidated. — Improvements in Boston Con. Mill. — Lead Furnace at Tintic Smelter Blown In. — Jennie Gold Mining Co.'s New Plant.

The management of the Garfield smelter will install a battery of Dwight sintering furnaces. During the past summer a series of tests were made with the concentrate from the Utah Copper mill, and the conclusion has been arrived at that these machines will assist materially in solving some of the difficult problems presented by the fine product from the Garfield concentrator plants. It is understood, however, that the H. & H. furnaces will not be thrown out altogether, but that both systems will be utilized to advantage. Owing to the metallurgical difficulties experienced at the Garfield smelter, the plant has been taxed beyond its limit, and as I have stated in a previous letter, a state of congestion exists that was not contem-

plated a few months ago. I visited the Boston Consolidated concentrator last week and ascertained that no shipments of concentrate had been made from that source to the smelter for many weeks, and I saw a huge pile of concentrate covered with a canvas for protection from the elements, that represented a value of about $300,000. It appears that the smelter management has arranged with the Boston company to withhold the mill-product for the time being, but in the meantime is making substantial cash advances on it. The best evidence that I found of this was a sign posted up in a conspicuous place indicating that the concentrate belonged to the American Smelting & Refining Co. Hence, it is quite immaterial to the Boston Consolidated whether the product of its mill is moved over to the smelter now, or at some future time.

During the month of August, the Boston Consolidated mill treated about 850 tons of the Bingham porphyry-ores daily, which averaged 1.7% copper, yielding a concentrate assaying from 20 to 22% copper, while the extraction was about 71%, or 1% above that of June, which held the record. The August milling-costs were also lower than at any time since the plant was placed in operation, being about 50c. per ton. Four units of the mill were operated; but four more are ready and will be placed in commission as soon as the mine management supplies the ore, which will be about September 15. Treatment will then be given to 1600 tons of ore per day. Ultimately it will take care of 5000 tons; when, it is expected, the costs per ton for milling will be reduced to 35c. per ton.

The Boston Consolidated is about to cut off an important item of expense by installing a Barr & Jackson centrifugal pump, adding it to the equipment of the pumping plant, and developing certain springs on its own property. At present the mill is supplied with water by the Garfield Water Co., in which the Boston Consolidated, Garfield Smelting, and Utah Copper companies are joint owners. The springs referred to will furnish all the water needed to operate the mill at full capacity, and will therefore do away with the necessity of buying it in the future, for it constitutes an important item of expense. The only cost hereafter will be that of pumping and maintenance of the pumping plant. The difference in the elevation between the pumping plant and the mill is 300 ft. vertically, and the length of the pipe-line is 4400 ft. A reservoir with capacity for 1,500,000 gal. of water is situated on the side-hill above the mill.

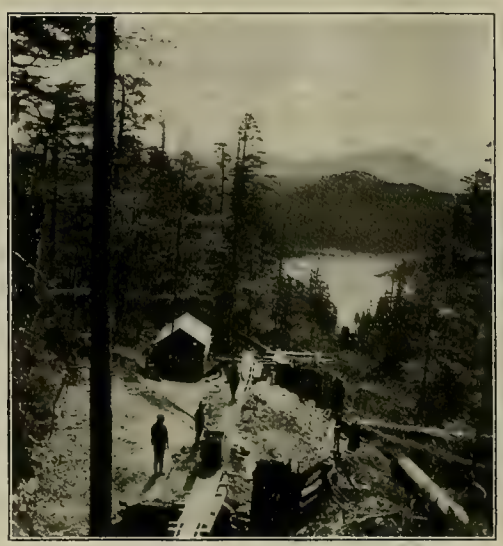
The lead department of the new Tintic smelter is in commission, and the initial bar of bullion was produced therefrom on August 29. This plant is equipped with four lead furnaces, and one copper furnace. The latter will probably be placed in commission about October 1. Producers in the Tintic district are manifestly interested in the operation of a smelter in the camp, as they are assured of a market for ores which will not stand the cost of shipment to other places for treatment. The cyanide department of the mill at the Jennie Gold Mining Co.'s property at Gold Springs, Iron county, which was damaged by a cloud-burst last July, is ready for operation. The plant has a capacity to treat 50 tons per day.

JUNEAU, ALASKA.

Developments on Chichagoff Island.—New Installations at Mills Mine. —Eagle River Operations. — Erecting 200-Stamp Mill in Silver Bow Basin. — Alaska United Gold Mining Co. — Ready Bullion Mine.

During the summer there has been considerable activity both in mining and prospecting at Klag bay on Chichagoff island, but no new discoveries of any importance have been reported. The De Groff mine, which up to this time has been the only producer, has been running continuously. The orebody which is being worked consists of two shoots, one 50 ft. long and the other 60 ft. long on a vein averaging 5 ft. in thickness. The upper adit has not been driven to the end-line, so that it is not known whether or not there is another shoot. The lower adit has not reached the orebody up to the present time. At the Mills property, which lies on the extension of the De Groff vein, development has been carried on actively during the summer. The work done up to the present time consists of 600 ft. of driving and 300 ft. of open-cut work. The management is preparing to install a 2000-ft. aerial tram to convey the shipping-ore to tide-water. Ore assaying $100 or more per ton is classed as 'shipping-ore,' and is sacked and shipped to the Tacoma smelter, usually by gasoline boat as far as Sitka. The remainder is thrown on the dump to await the advent of better transportation facilities or the erection of a mill. On Hirst Cove, which lies to the north, over Doolthk Mtn. from Klag bay, development is being done on the claims owned by Bernard Hirst, of Sitka. Some work is also being done on the Bahrt claims, which lie on the south side of Doolthk Mtn., on what is supposed to be an extension of the Hirst orebody.

The Eagle River mine, situated about 20 miles northwest of Juneau, has been steadily producing bullion, and it is reported that the results of new exploration and development have been very satisfactory. At the Perseverance mine, in Silver Bow basin, work is being pushed on the foundation for the second hundred head of stamps, and in the meantime the first hundred has been kept working at full capacity. Assessment and development work are being done on the Denny claims in Sheep Creek basin. A tramway line is being surveyed to connect with the tramway already built up Sheep creek from the old stamp-mill. A small force of men is engaged in developing the property at Sumdum bay. The lode which has been explored yields high-grade ore, but it is very narrow. The outlook, however, is good.



On Chichagoff Island, Alaska.

The re-grinding and amalgamation plant which has been installed at one end of the 100-stamp mill of the Alaska United Gold Mining Co.'s 700-ft. mine, has commenced operation. This plant is designed to treat 50 tons per day of Douglas Island concentrate, reducing them from an average value of about $60 to less than $30. It is estimated that a net profit of $3 per ton of concentrate will be made, over that made by shipping directly to the smelter. The plant consists of one tube-mill, one 24-ft. amalgamating plate, amalgam-trap, automatic samplers, settling tanks, and storage bins.

Sinking has been resumed at the Ready Bullion mine of the Treadwell group; the bottom now is at the 1500-ft. level. This will necessitate installing a new hoisting engine, as the one in use will not be able to hoist from a deeper level.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Sherardizing is a dry process of galvanizing, in which the articles to be coated are packed in a closed receptacle, in contact with zinc-dust. The receptable is then kept at a temperature of from 400 to 600°F. for a period of time depending upon the thickness of the coating desired, after which it is allowed to cool before being opened.

Settlement of earth embankments depends upon the material, the method of constructing the fill, climatic and other conditions. Railroad engineers commonly assume that earth embankments settle 10% of the vertical height, and make no allowance for lateral shrinkage. Rock-fills occupy from 1.25 to 1.9 times as much space as did the original material in its native bed.

A pendulum to beat seconds should be 39.1 inches long. The exact length would of course vary with the latitude and the altitude. The number of vibrations which different pendulums will make in a given place in a given time is inversely proportional to the square root of their lengths. The time in which different pendulums will make a complete vibration varies directly as the square root of their lengths.

Hungarian riffles consist of cross-groovings in the bottom of a sluice, so arranged that the current of water and sand will fall over an edge into the groove, which is recessed on the up-stream side underneath the lip, thus producing an eddy in which gold or other heavy substances will be deposited, while the lighter material will sweep on with the current up the sloping down-stream side of the groove to the next lip. This old principle is now utilized on gold dredges, the riffles being made of angle-iron.

Storage batteries of the most improved design are those in which the electrodes are of sponge-lead and lead peroxide, which when immersed in dilute sulphuric acid, form a voltaic couple. Its action is the same as the ordinary primary battery, except that when it has given out all the energy that the chemicals present enable it to supply, instead of having to put in new chemicals, the cell can be regenerated by passing current into it in a direction opposite to that in which the flow took place on discharge.

Hydraulic gradient is the line to which water-levels would rise if piezometer tubes be inserted along a pipe-line, the flow through which is due to the action of gravity. For a pipe of uniform size, with no sharp turns, the hydraulic gradient is approximately a straight line. A water-main should be laid so that all points are well below the hydraulic gradient, else air will collect in the high parts and materially reduce the quantity of the discharge. If it be absolutely necessary to have a considerable portion of the main above hydraulic gradient, an air-chamber should be provided, from which the air may be exhausted as it collects.

Mill-sites are located by posting notice and staking by a substantial post at each angle. Ordinary prudence would require that the stakes be inscribed with the name of the mill-site and the number of the corner. There are no statutory regulations as to the details of such location, but their record should conform to the requirements applicable to the record of all classes of claims. In other words, where any record whatsoever is essential to either original claim or a subsequent conveyance, it must contain a description sufficient to identify the land intended to be described. The shape of the claim is immaterial, provided its area does not exceed five acres.

The U. S. standard gauge for sheet and plate iron and steel is based on the fact that a cubic foot of iron weighs 480 lb. A sheet of iron one foot square and one inch thick weighs 40 lb., or 640 oz. Therefore a sheet of iron one foot square and $^1/_{640}$ in. thick weighs one ounce. The scale has been arranged so that each number represents a certain number of ounces in weight, and an equal number of 640ths of an inch in thickness. The numbers range from 0000000, which weighs 320 oz. per square foot and is 0.5 in. thick, to 38, which weighs 4 oz. per square foot and is 0.00625 in. thick. An act of Congress requires that, after July 1, 1893, this gauge shall be used in determining the duties and taxes levied on sheet and plate iron and steel. Unfortunately, neither this nor any other system has come into universal use in this country, and as a result much confusion is entailed. The decimal system is used by a number of manufacturers, and is recommended by a joint committee of the Am. Soc. M. E. and the Am. Ry. M. M. A. The numbers of this system correspond to the number of thousandths of an inch in the thickness of the sheet.

Sea-water has been successfully used on a practical scale in Chile for making up cyanide solutions. In that particular instance the extraction of the gold was high and the consumption of KCy well within limits of commercial success. The composition of the ore, however, must have been unusually favorable. While sea-water is inert toward potassium cyanide, chemical complications would easily result in any but a very simple ore. As an example, the presence of decomposing pyrite would yield ferrous sulphate which would promptly react with the salt in the sea-water, as follows:

$$Fe_2(SO_4)_3 + 6NaCl + 3O = Fe_2O_3 + 3Na_2SO_4 + 6Cl.$$

Not only is an energetic cyanicide liberated by the above reaction, but exhaustion of the oxygen ensues, which is essential in the solution of gold, as shown by the classic Elsner equation. Under the circumstances, polarization would occur at so early a stage of the treatment that the anticipated extraction would be very low, and the cyanide consumption extraordinarily high. Before using sea-water a very careful study of a quantity of ore reserves sufficient for a long campaign, should be made.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Fee-Simple Tenure of Mining Property.

The Editor:

Sir—In the editorial in your issue of August 29 on the 'Fee-Simple Tenure of Mining Property,' certain questions are raised which perhaps admit of further discussion. You say, "Here, at bottom, rests the great difference which gives paramount advantage in point of security to a title in fee-simple. It is a title which protects the man, whereas under the concession-system the man must protect the title." The question at once arises whether it is to the interest of society to protect the man rather than the title under the supposed conditions, namely, of refusal to abide by the conditions of a lease. If the man is willing to abide by such conditions, evidently leasehold affords as good title as fee-tenure. If he is not willing to do so, why should he be protected? As you suggest, the answer touches the foundations of our social organization. In the years past, Americans have preferred to "protect the man," whether he let his property lie idle, wasted the bulk of his ore, or did any of those things which presumably would be forbidden in a lease. This, I believe, has been because there has been an excess of property. We have, in a way, been living on an inherited surplus, and what one man wasted, devoted to improper uses, or fenced off and kept from development, did not seem to be taken from anyone else. There was no pinch of poverty and accordingly no discontent. Each took what he would and did as he pleased. The result was the development of the magnificent individual initiative which has contributed so much to American success. Such a spirit has been worth much, and, if it were possible by maintaining the fee-tenure system to maintain this spirit, it would probably be worth the price. But, as pointed out by so accurate an observer as Bismark as early as 1868, our institutions must face a wholly new trial when our surplus begins to be exhausted. When there are no more farms to be taken up, the non-use of agricultural lands by any owner becomes a matter of general concern. When the forests begin to disappear, it is a grave question whether we can afford to continue to protect the title of a man who destroys his forests and provides for no renewal. When copper becomes scarce, society can hardly afford to protect the man who wastes copper. In other words, changing conditions, and particularly the exhaustion of our surplus, must change our attitude. Actually the change occurs whether we will or not. Under our policy of individual ownership a single company now has a monopoly of the coking coal of the inter-mountain country, and a small group of companies holds the anthracite fields of the East. Are there any reasons to suppose that under a leasehold system individual initiative will be more repressed than under a system of large private monopolies? Opinions may differ, but personally I doubt if there are.

In municipal public utilities, where there are many analogies, we are meeting the situation by the development of a system of leaseholds, or 'franchises,' giving privileges for a term of years, and permitting periodic readjustments to meet changed conditions. While there have been many scandals, and while many objections may be urged against such a plan, it seems to me to be the only ultimately feasible one as regards our mineral resources. The time for its application to different industries must be studied with care, holding on to the individualistic system in each case as long as may be. There are reasons for believing that the time has already arrived for applying the new system to the remaining public coal-lands, and there are some suggestions at least that the same is true of mineral lands in general. Whenever individual prospecting fails to bring in new camps and orebodies as fast as the market demands metal, when organized scientific prospecting of large territories becomes necessary, then, I believe, it will be advisable to adopt some form of concession covering large tracts, but subject to periodical readjustments to meet changing conditions; in other words, a leasehold system. To my mind it is not a question of whether such a system would prove as stimulating to the individual as that under which our grandfathers did live, but whether it would not be more stimulating than any other under which our grandchildren would otherwise live. This, as you say, is no longer an academic question, and a right solution demands the best thought and effort of all of us.

H. FOSTER BAIN.

San Francisco, August 31.

Professional Ethics.

The Editor:

Sir—'Constant Reader,' in your issue of August 29, emphasizes, by citing direct cases, two of the many nice points in professional ethics which are stumbling blocks to the inexperienced engineer. Delicate situations arise in the life of an engineer which require diplomatic handling, and happy is he who can keep his head above the waters of unjust criticism. Discussing the questions asked in a general way, I hold that, inasmuch as the young engineer is particularly well informed as to the condition of the mine, mining costs, and other facts essential for the expression of an intelligent opinion, he is committing no breach of professional etiquette if he advises his client of the facts, using the information he has gained while formerly in the employ of the company which is now soliciting aid from his client. A hurried trip through the mine previous to the giving of advice, to convince the engineer that conditions have not changed, might be advisable, and would be sufficient to support his statement. In all cases the engineer must be sure of his premises before expressing his conclusions. Advice should only be given on certain knowledge. The tendency of the times is to conduct mining operations on strictly business principles; the open-door policy is fast coming into favor, so that in most cases a would-be investor is able to get reliable information concerning the property. The size of the investment,

the amount of money involved, is not the vital question; the point is, is it a reasonable venture? Should the engineer know positively that the business methods of the company are subject to criticism, or should he be in possession of reliable information that the mine is exhausted, or that its future is doubtful, when directly confronted with the question, he is at liberty to reply. An evasive answer or refusal to reply might be misconstrued and end disastrously to both himself and client. If he from positive knowledge condemns the property, he is benefiting the mining community directly, and his client particularly, by expressing himself, and if he is equally well assured that the property has merit, and that its affairs are being properly administered, he will never be censured for giving it a boost.

I do not indorse the widespread publication of information given in confidence, but as a doctor to a patient, specific knowledge can conscientiously be used in making out the prescription. First be sure of your premises, then have the courage to express your convictions. But at all times act honestly and honorably with yourself, your former employers, and present clients.

FRANK H. PROBERT.

Los Angeles, August 31.

An Automatic Ore-Sampler.

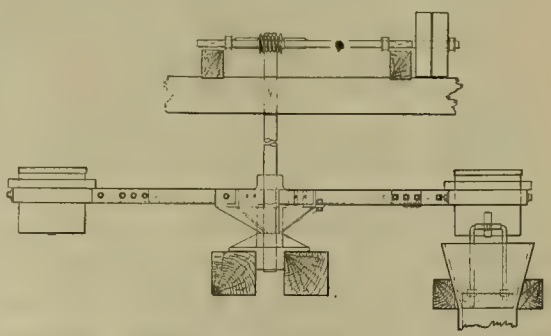
The Editor:

Sir—In considering the merits of automatic sampling-machines, it should be remembered that the danger of taking out an uneven sample (unless the ore is very fine) is caused by the larger pieces of ore striking together at the entrance of the slot-cup and rebounding while the fine ore is allowed to pass on to the sample. This continued loss of coarser ore (the coarser, the greater the discrepancy) causes quite a variation in the sample.

I described a sampler in the MINING AND SCIENTIFIC PRESS, November 28, 1903, which had more than one arm extending with buckets on the end; the idea being to use anywhere from one to eight buckets, depending on the value of the ore and proportion of sample desired. As there has been a great revival in mining in Nevada since that article was written, it may be of interest to ore shippers to again describe the method of hand-sampling adopted and some of the dangers of automatic sampling of rich ore.

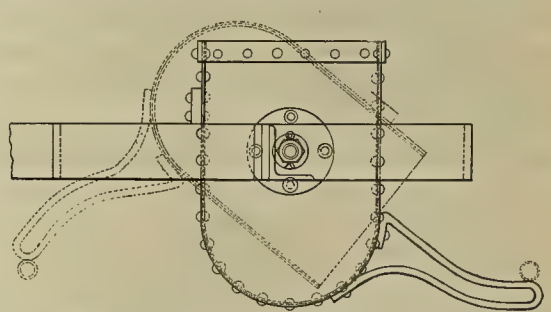
In custom-samplers, whether independent or in connection with a smelter, it is best to have every department simple, and with as little mystery as possible, so that the shipper will have his ore in plain sight all through, from the time it is weighed until he receives a portion of the pulp sealed, with the sampling-works' seal. I have heard of cases where shippers also put their seal on the umpire sample before it is set aside. In this way he can make a perfect check on the assays of the purchaser, and, if he is not satisfied with the methods of sampling, may make his complaint before the sample is completed.

The method of hand sampling usually adopted by the smelters is as follows: first, crush the ore to reduce all the lumps below a certain size; then take out every third, fifth, or tenth shovelful for a sample, as the ore is wheeled away to the storage bins. The proportion taken for a sample depends either upon the size of the lot to be sampled or the richness of the ore (in fact, the entire bulk of small lots of rich ore is often treated as a sample). Every third shovelful of this sample is then taken and passed through a set of rolls; the rolls are then set up much closer, and half of this sample, by taking out every alternate shovelful, passes through again. This re-



Automatic Sampler.

duced sample is now taken to the sample-room, which room is enclosed with windows for light, and enables the shipper to watch the work. The floor where the sampling is done is covered with steel plates. The sample, as brought from the rolls, is deposited in two piles, then coned into one cone, and carefully flattened out and cut into four quarters, two quarters being taken for the sample, and two quarters being rejected, care being taken to alternate, that is, if the first two quarters taken up in a wheel-barrow are rejected and the remaining two quarters are re-coned for a sample, the next time the sample is coned and quartered, the reverse is



Bucket and Tripping Device.

done by re-coning the fisrt two quarters lifted, and rejecting the remaining two quarters on the plate. This is done in order to avoid any chance of favoring either the shipper or the purchaser. At several smelting works where they adopt hand-sampling a divider is used, upon which the ore is thrown when forming the cone, so that when rejecting two quarters and re-coning the other two, a clean division is made, and there is no danger of taking out too much or too little for the first two quarters removed. This cone-centre divider is a simple contrivance, being nothing more than a cross, made of narrow strips of sheet steel set on edge and crossing each other

at right angles. After the sample is reduced in weight to about fifteen to twenty pounds, it is put through an ordinary sample-grinder, which reduces it to a fine powder. From the grinder it is taken in covered buckets to the assay office, where the assistant assayer thoroughly mixes it, by continuing the operation of coning and quartering, until the sample is reduced in quantity to about 40 oz. Although at this stage, when the sample is so extremely fine, cutting down with a riffle is quicker and just as accurate. This 40-oz. sample is then passed through a 100 or 120-mesh sieve, by grinding the pulp, which is too coarse, on a smooth cast-iron bucking-board, with a heavy muller. Should any scales of native gold or silver be caught they are cupelled with a little lead, and weighed; the pulp from which the scale was seived is also weighed, the percentage-value calculated, and added to the assay. After the pulp is all through the sieve, it is again thoroughly mixed and put into three different sample-sacks, one to be assayed at the works, one to be sealed and set aside for umpire, in case an umpire should be called for, and one to be sealed and handed to the shipper, or mailed to him. Settlements are made as soon as the assays are compared between the shipper and the smelter, or else the settlements are forwarded on the smelter's assays, for nearly the full net value of the ore; and corrections are made afterward. If the shipper finds any material difference between his assay on the smelter's pulp and the assays of the smelter, a re-assay is called for by both parties. If these repeated assays do not satisfactorily agree, then some reputable assayer is called on as umpire who shall be mutually agreed upon between the shipper and purchaser, and his results are accepted as final.

The same methods as described above are followed in the sampling of concentrate, except that no crushing or rolling is necessary. In some sampling works and smelters, samples are first taken out by hand-shoveling, then rolled, and completed with automatic samplers.

To the owners of mills handling none but their own ore the importance of expensive hand-sampling does not appeal, but to the shipper it does. I admit that hand-sampling is expensive, and one has to depend upon laborers being careful in taking the sample-shovelfuls from the same place they take the rejected portion; and for this reason I propose a compromise by taking out the first sample automatically, and then completing the sample by hand-labor, as described above. To do this and take samples of both coarse and fine ore as it comes from the crusher in plain sight, economically and with as little danger of salting as there would be with shovel-sampling, I have outlined the following system: the ore as it is received after being weighed can be dumped or shoveled into a crusher; from the crusher it drops into an ordinary ore-car, by which it is conveyed over the bins or mixtures. Between this ore-car and chute from the crusher, pass the buckets of the sampler, so arranged as to time, size, and number, that an average sample of the coarse and fine is anywhere from one-twentieth to eight-twentieths, no matter how coarsely the ore is crushed. If a larger portion is desired for a sample, it would be just as well to take out the entire sample by hand, re-crushing at different stages to make the ore finer as the quantities are reduced. The method of hand-sampling for very rich ore appeals to any one interested in sampling, as being the most accurate and safest way. When sampling an extremely rich ore, it is well to check the sample. If one makes duplicate samples with an automatic sampler, and the work has been done imperfectly, on account of the ore being too coarse or the machinery being full of leaks and places to catch dust, the error is only repeated. In hand-sampling, a very fair way is to cone the entire lot or sample, then divide it by taking two opposite quarters for one sample, the two remaining quarters for a duplicate sample, and then take the average of both samples for settlement. Automatic sampling is certainly the cheapest and best method for mills and smelters treating their own ore. But in the sampling of rich custom ore the saving of a few cents per ton is poor economy compared with the danger of salting the sample and not giving satisfaction to the shipper.

S. E. Bretherton.

San Francisco, August 17.

Foothill Copper Belt of the Sierra Nevada.

The Editor:

Sir—As indicated by his letter in your issue of July 11, John A. Reid seems to have taken to heart my criticism of his paper under the above title in the issue of March 21. Perhaps I looked too much upon the copper deposits of the 'foothill belt' as commercial propositions, rather than as interesting studies in ore genesis. That I was not unreasonable in fearing that the paper might mislead the general reader will be evident from a brief review of it. Mr. Reid starts with the avowed intention of "beginning a complete study and description" of the entire foothill belt, but later says that "the southern half, which is probably the more important, is the one forming the main subject of this paper." Then he proceeds to describe in general terms the geology of the entire region, falling back on a few prominent mines, such as the Campo Seco, Copperopolis, Pocahontas, Great Northern, Cavan, and Napoleon as illustrations. He makes a number of comprehensive statements, such as, "The copper belt is characterized by a small amount of secondary ore, either oxidized or sulphide." Then he describes in some detail the Copperopolis and Pocahontas mines, after which he announces, "The conclusions to be drawn from the facts presented in this paper are not many, but they are important." Among these 'facts' are comprehensive statements such as the one previously quoted. Although he disclaims the intention of writing other than a preliminary paper, the whole tenor of it implies a wide acquaintance with the belt, and, coming from a man of his position and attainments, it is bound to mislead the unwary.

I have not intimated that Mr. Reid's paper "was based upon the examination of but one deposit," but of "only one of the many types of deposit repre-

sented'' in the belt, a type in which the secondarily enriched sulphide-zone is very shallow and unimportant, and in which some of the primary sulphides constitute ore in the commercial sense.

I hope my criticism will not discourage Mr. Reid from continuing the publication of his studies on the foothill belt. We need all of the knowledge he possesses and will gain in the future regarding the ore deposits of the belt by having his data.

In *The Engineering and Mining Journal* Herbert Lang published a paper, in three parts, under the title of 'The Copper Belt of California,' in which he gives an interesting description of the economic features, geology, ore deposits, precious-metal contents, methods of ore-treatment, and the history and extent of the more important mines and prospects for future operations in the foothill copper-belt. The writer evidently had an intimate knowledge of the Fresno mine, a rather wide partial acquaintance with many other important properties, and had extensively consulted the literature on the copper-belt. It is not my purpose to criticise the article in general, but I wish to call attention to certain phases of it. In writing of the sulphides occurring in the belt-mines, Mr. Lang says that pyrite and pyrrhotite are the prevailing minerals, the former characterizing the northern part of the belt, and the latter the southern part. ''The copper mineral is chalcopyrite almost exclusively in these sulphide masses, chalcocite being totally absent, and bornite only occasionally reported.'' Mr. Lang is evidently describing only the primary sulphides of the belt. Although his paper pretends to be a comprehensive discussion of the entire belt, he fails to mention the many places where the secondary enrichment process has taken worthless primary sulphide rock and made commercial ore by altering it and adding to it chalcocite, bornite, and probably in places secondary chalcopyrite. Hence, when he says in his general conclusions that ''it will have been gathered that the deposits conform closely to a single type, it is evident that he has laid himself open to the charge of basing conclusions on imperfect acquaintance with the facts, and of making them too general. Mr. Lang's paper would be more valuable if he had thrown together all the evidence concerning a single mine, as, for instance, the Fresno mine, and then drawn a conclusion to apply to it alone, treating each mine with which he may be intimately acquainted in a similar manner.

The term 'ore,' as used by such writers as Lang and Reid, is likely to mislead the untechnical reader, who generally thinks of 'ore' as something possible of profitable exploitation. I agree with Mr. Reid that in the country southeast of Copperopolis the value of most of the mines depends upon whether or not any large part of the primary sulphides is ore in the commercial sense, but I go farther in asserting that at most properties it is not. Perhaps the primary sulphide rock of the Fresno mine, 70% of which is pyrrhotite, carries more chalcopyrite than any other large body of pyrrhotite on the belt, but Mr. Lang concedes that it contains hardly 2% copper. Where the principal primary sulphide is pyrite there is more chance for commercial ore.

In conclusion, I will repeat that the purpose of my criticisms is not to discourage discussion of the foothill belt. Mr. Reid has given us a detailed discussion of the Copperopolis and Pocahontas ore-bodies, and from Mr. Lang's paper we can get a fairly good description of the Fresno mine; now give us similar descriptions of several hundred other mines and prospects on the belt and we will be ready to formulate general conclusions.

OSCAR H. HERSHEY.

Reno, Nevada, August 17.

A Theory of Ore Deposition.

The Editor:

Sir—Referring to J. E. Spurr's able article on 'A Theory of Ore Deposition,' and his letter in your issue of May 16, a point has been raised, upon which I think several, like myself, may also 'want to be shown.' Of the many who seek for ''veins traversing the eroded rocks of rich placer regions,'' how few shall find! In the same issue I note that, notwithstanding a placer production of $37,000,000 in the Seward Peninsula, there has been but one successful attempt at lode-mining.

Where are the lodes corresponding to the vast tin placers of Malaysia? Would erosion have been very active in jungle and swamp? Personally, I have failed to find lodes commensurate with the gold placers of South America. Conversely, have there been placers of sufficient extent accompanying the lodes of Cornwall, Mysore, South Africa, or West Australia to justify the erosion theory? Will a majority of your prospector readers admit an all-embracing unfilled fault-channel theory, however much the root-deposit may appeal to us? Mr. Spurr jettisons the descending water theory; even the sea-water solution returns to the depths of oblivion. Why not jettison the veins? Can the metals have condensed out of vapor emanating from barely perceptible cracks, such as cleavage-planes in slate? Is it not a fact that the gold of placers seldom if ever occurs in quartz, and how does the erosion theory satisfactorily account for nuggets? I confess myself puzzled.

JOSE T. PRYOR.

Buenos Aires, Argentine Republic, July 11.

Pig iron production in the United States during 1907 amounted to 25,781,361 long tons, as compared with an output of 25,307,191 tons in 1906, and of 22,992,380 tons in 1905. The small increase shown by 1907 over 1906 is due to the falling off in demand and production during the last quarter of the year. If the output of the first half of the year had been maintained, 1907 would have shown a total production of about 27,000,000 tons. The production of Bessemer steel ingots and castings in 1907 was 11,667,549 long tons, against 12,275,830 tons in 1906, a decrease of 608,281 tons. The total production of open-hearth steel ingots and direct castings in the United States in 1907 was 11,549,088 long tons, against 10,980,413 tons in 1906, an increase of 568,675 long tons, or over 5.1 per cent.

MILLING PLANT OF THE MONTANA-TONOPAH MINING COMPANY.

Written for the MINING AND SCIENTIFIC PRESS
By G. H. ROTHERHAM.

The reduction of silver ores by wet milling and cyaniding, which has been studied to good purpose in Mexico, has had a comparatively limited field in this country. Doubtless the best practice is to be found at Tonopah, Nevada, where three well equipped mills are now successfully treating silver ores. The latest of these, the Montana-Tonopah Mining Co.'s plant, designed and erected under the supervision of the consulting metallurgist of the Company, F. L. Bosqui, and equipped by the Allis-Chalmers Co., possesses certain unique features which may be considered innovations in the metallurgy of silver. The ore is a gold and silver-bearing sulphide. The chief gangue-mineral is quartz, the vein-matter being a quartz replacement of the andesite. In the milling-ore the proportion of gold to silver by weight is 1 to 100. Some of the gold is undoubtedly free, the remainder being associated with the silver in the sulphide. The prevailing silver minerals are stephanite and polybasite; while beautiful specimens of ruby silver have been taken from the richer portions of the mine. Lead, copper, and zinc also occur in small quantity.

The ore, as it comes from the mine, is delivered to a 200-ton steel bin, which stands directly in front of the head-frame and adjoins the primary crushing plant. From this bin the ore is fed through a counterbalanced gate to a No. 5 K Gates gyratory breaker, which reduces it to 2-in. size. Thence it passes to a No. 5 B Gates bucket-elevator that discharges into an iron-frame revolving screen with one-inch perforations. The oversize from this screen is re-crushed in two No. 3 D Gates breakers to 1-in. size, this product then joining the undersize from the screen and passing to a 14-in. belt-conveyor, which conveys the ore to the mill-bins. This belt is 190 ft. long, and operates at an angle of 12°. It discharges onto a horizontal belt extending the length of the bins, the latter being provided with a tripper for distributing the ore. The crushing plant has a capacity of 25 tons per hour, and is operated only during one 8-hr. shift. From the bins the ore is delivered by eight suspended Challenge feeders to a battery of 40 stamps. The stamps weigh 1050 lb. and fall 100 times per minute through a 7-in. drop. The battery is the three-post, back-knee type, with wooden mortar-blocks, composed of 2-in. planks solidly spiked together and set on rubble concrete. The mortar is the Allis-Chalmers 'Homestake' narrow pattern, with extra heavy base. The battery is arranged in eight separate units, operating independently. The main counter-shaft rests low on the battery-sills, admitting of the prompt shut-down of any unit without hanging up the stamps individually. The shoes are of chrome-steel. The dies are made at a local foundry, and consist of 35% car-wheel scrap, ½% powdered manganese, and the remainder of chrome scrap. These dies give good satisfaction, whereas the chrome-steel dies were found to 'cup' badly.

The ore is crushed in cyanide solution through 20-mesh woven-wire screen, with the diameter of wire 0.016 in., and an aperture of 0.0173 in. The strength of the circulating mill solution is 0.13% cyanide of sodium. The average size of the crushed battery pulp is shown by the following screen analysis:

	Per cent.
Remaining on 30-mesh	2.53
Passing 30-mesh, on 60-mesh	25.5
Passing 60-mesh, on 80-mesh	4.8
Passing 80-mesh, on 100-mesh	6.1
Passing 100-mesh, on 200-mesh	16.0
Passing 200-mesh	45.07

From the battery the ore goes to eight 24-in. cone-classifiers, with 50° sides. The spigot-discharge feeds eight Wilfley concentrators, the slime and fine sand-overflow joining the main pulp-stream after concentration. The whole mill-stream is then elevated to two Dorr classifiers for de-watering and further classification, preparatory to tube-milling. The Dorr machines are doing satisfactory work, but, as manufactured, were too lightly constructed, and had to be extensively re-inforced. The best consistence of pulp for tube-mill purposes was found to be about 45% moisture. The excellent work done by these classifiers in separating a sandy product is shown in the following sizing tests:

PULP DISCHARGE FROM DORR CLASSIFIERS TO TUBE-MILLS.

	Per cent.
Remaining on 30-mesh	6.2
Passing 30-mesh, on 60-mesh	42.6
Passing 60-mesh, on 100-mesh	21.2
Passing 100-mesh, on 200-mesh	16.2
Passing 200-mesh	11.6
Loss	2.2

It is worthy of note that 70% of the pulp entering the mills is coarser than 100-mesh, and that the slime has been almost completely separated.

SLIME OVERFLOW FROM DORR CLASSIFIERS.

	Per cent.
Remaining on 100-mesh	2.5
Passing 100-mesh, on 200-mesh	15.5
Passing 200-mesh	82.0

The two tube-mills in use are the Allis-Chalmers, spur-gear driven, trunnion type, 5 by 22 ft., lined with 4-in. silex blocks. They make 27 r.p.m. The initial starting-load for one mill requires 60 hp., while both mills in simultaneous operation take 85. Each mill is now re-grinding 52 tons per 24 hr. This is the safe limit for this ore, considering the fineness of pulp desired for the best economical work in the cyanide plant. The size of pulp issuing from the tube-mills is as follows:

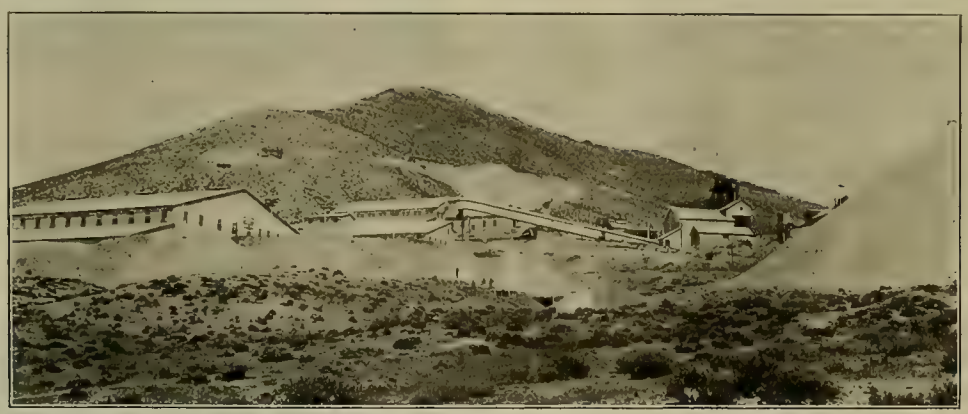
	Per cent.
Remaining on 60-mesh	1.0
Passing 60-mesh, on 80-mesh	1.5
Passing 80-mesh, on 100-mesh	4.0
Passing 100-mesh, on 200-mesh	27.5
Passing 200-mesh	66.0

The pulp from the tube-mills, after proper dilution, is re-classified in two 48-in. cones with 50° sides. The underflow from these is returned to the mills; the overflow joins the stream from the lower ends of the Dorr classifiers, and passes to three 8 by 54-in. Frenier sand-pumps, which elevate it to two thickening-cones, preparatory to secondary concentration

on Frue vanners. This pulp, representing the final re-ground product, shows the following distribution of sizes:

	Per cent.
Remaining on 100-mesh	2.8
Passing 100-mesh, on 120-mesh	7.6
Passing 120-mesh, on 150-mesh	8.6
Passing 150-mesh, on 200-mesh	8.9
Passing 200-mesh	72.1

The Frue vanners, though not ideal slime-concentrating machines, do good work on this fine product. The concentrate from the Wilfleys and vanners is removed by traveling buckets to a drying-house adjoining the mill, where it is sacked for shipment to the smelter. From the lower concentrating floor the whole re-ground mill-pulp goes to the cyanide plant for treatment by agitation. All cyanide tanks are made of redwood, excepting the Hendryx agitators. These are constructed of Oregon fir, which, in my opinion, is inferior to redwood for cyaniding purposes. The mill-pulp, containing six parts of cyanide-solution to one of ore, is fed alternately to the centre of three settling-tanks 30 ft. diam. by 10 ft. deep at the centre, with a false-bottom sloping 12°.



Montana-Tonopah Mill, Tonopah, Nevada.

These tanks are provided with leveling rim, overflow launders, and decanting apparatus. By means of a series of decantations, the pulp is reduced to the proper consistence for agitation. Every twelve hours 75 tons of pulp, the contents of one settler, are transferred by a 6-in. Morris centrifugal pump to two of the agitators. There are six Hendryx agitators in use, 17 ft. diam. It requires 6 hp. to agitate a charge of 35 tons of ore (dry weight). The pulp in the agitator has a specific gravity of 1.28 to 1.32. A 0.2% solution of NaCy is used, and 0.3 lb. lead acetate per ton of ore. The agitation is continued for thirty-two hours. The pulp is then drawn through the same pump as mentioned above, and raised to a pulp-storage tank, 30 ft. diam. by 17 ft. deep, provided with stirring-arms making 8 r.p.m. From this tank the pulp is drawn as required into the Butters filter-boxes.

The Butters plant consists of two redwood boxes, of four compartments each. Each box contains 72 filter-leaves. Pulp and solutions are handled by an 8-in. Morris centrifugal pump, and a 12 by 10-in. Gould duplex vacuum-pump. The solution from the Butters filter is re-filtered in a 30-in. frame filter-press, whence it flows to the precipitation tanks. There are three of these, 14 by 14 ft. The zinc-dust is added as an 'emulsion' from a small feed-cone, and passes directly into the suction of the pump, which raises the solution to the Merrill precipitation-presses set up in a separate building, 100 ft. above the precipitation-tanks, and immediately above two 28 by 8-ft. solution-storage tanks. These two presses have triangular-shaped plates, 48 in. on edge. There are thirty plates in each press, with frames spaced 2 in. apart. The solutions are raised by a 5 by 6-in. Aldrich triplex pump. From the presses the barren solution runs to the storage tanks, whence it passes into the general mill-circulation. The present method is to draw from the circulating mill-supply of solution the quantity required for agitation purposes. This amount is brought to the required strength in the agitators, and, after precipitation, it passes again into the mill-circulation; so that there is really but one solution used throughout. The value of the mill-solution is kept low by precipitating about 150 tons of it daily. That portion of the mill-solution which is not used for extracting purposes overflows the rim of the settling-tanks almost clear, but is further clarified by flowing through a three-compartment, pointed, clarifying-box, each compartment being 10 ft. square at the top. Thence it flows to the mill-sump and is raised by means of an 8 by 12-in. Gould triplex pump to a 70,000-gal. concrete reservoir on the hillside above the stamps.

Zinc-dust precipitation, as used by C. W. Merrill at the Homestake plant, South Dakota, and elsewhere, has been satisfactory in the practice at Tonopah from the first. It has the advantage of compactness, low cost for labor, and security from theft. The helper who tends the solution and water pumps gives a portion of his time only to the simple manipulation of the process. In estimating the cost of precipitation, I have not included the cost of raising the solution to the presses, inasmuch as this would have to be raised in any event for purposes of circulation; and the additional work on the pump imposed by the presses themselves may be disregarded, as the pressure at the presses never exceeds 8 lb. per square inch, and reaches this point only just before the

clean-up, when the frames are loaded.

The precipitate is sacked and shipped by express to the smelter. It was found, by careful calculation, that the high cost of fuel, fluxes, and labor would not justify refining this product on the ground, although an average sample of 114 lb. refined experimentally without acid treatment yielded 966.9 oz. (Troy) bullion, of a total fineness of 946.59. The following figures refer to a period of eight months, from October 1, 1907, to June 1, 1908, during which interval 34,766 tons of ore was treated, and 95,657 tons of solution precipitated.

Zinc-dust—33,903 lb., at 8.2c. per lb.	$2,780.00
Filter cloth—1368 yd. twill, at 34.25c. per yd.	413.82
Labor—one-third time of one man, at $4 per 8-hr. shift	960.00
Total	$4,153.82

For cleaning up the two presses, twice a month, it requires the services of four men for one shift of eight hours, or $256 for eight months.

SUMMARY.

	Per ton of solution precipitated.	Per ton of ore treated.	Per oz. fine metals recovered.
Cost of precipitating.	$0.0430	$0.1190	$0.01400
Cost of cleaning up...	0.0026	0.0073	0.00086
Totals	$0.0456	$0.1263	$0.01486

The efficiency of the precipitation is shown by the following figures, giving average assays in the precipitation of 95,657 tons of solution:

	Heads, gold oz. per ton.	Tailing, gold oz. per ton.	Heads, silver oz. per ton.	Tailing, silver oz. per ton.
Strong solution	0.0352	0.00149	3.39	0.0605
Mill or weak solution.	0.0290	0.00216	2.80	0.1590*

*Excepting the month of March, 1908, when, owing to a series of breakages in a poor quality of twill-filters, the tailing from weak-solution precipitation averaged 0.58 oz. silver, this average stands 0.058 oz.

For these eight months the check between the recovery indicated by solution-assays and the actual recovery from the presses is shown in the following:

	Gold, fine oz.	Silver, fine oz.
Indicated recovery by solution-assays	2,986.31	290,715.36
Actual recovery from presses	3,170.28	291,368.98

During the same period the average consumption of zinc-dust was as follows:

	Lb.
Consumed per ton of ore treated	0.970
Consumed per ton of solution precipitated	0.350
Consumed per ounce of metals precipitated	0.115

The total fineness of the precipitate, as taken from the presses, has ranged between 414 and 688, the average for the eight months being 517, or 51.7% precious metals. This product ranges between 12 and 20% zinc-content, and 10 to 15% silica. The presence of the latter ingredient is due to the extreme difficulty of completely clarifying the mill-solution before precipitation. To the eye these solutions appear perfectly clear, but they carry a small amount of solid matter, which is caught in the precipitation presses. A preliminary filtering system is now being installed, which will eliminate a great part of the silica, and considerably improve the grade of precipitate.

The cost of tube-milling from October 1, 1907, to June 1, 1908, works out as shown below. A 4-in. lining lasted from August 20, 1907, to April 20, 1908, or exactly eight months. During that time 31,835 ton was crushed by stamps, and 68% of this, or 21,511 tons, was re-ground.

Cost of power: 85 hp. for two mills, at $8, or $5400 in eight months.

Pebbles: 70,860 lb., at $50 per ton, or $1770 in eight months.

Silex lining: cost for two mills, using imported cement at $12.48 per bbl., $2216.92.

Labor: one-half of one man's time on each shift, at $4, $1440 in eight months.

Maintenance and repairs: on mills and Dorr classifiers, $79 per month, or $632 in eight months.

SUMMARY OF COST PER TON OF ORE STAMPED.

Power	$0.170	Maintenance and repairs	0.019
Pebbles	0.055		
Lining	0.069		
Labor	0.045		$0.358

Consumption of pebbles: 2.22 lb. per ton of ore stamped, or 3.29 lb. per ton of ore re-ground.

The following details on cost of re-lining one of the tube-mills may be of interest:

2500 silex bricks, at $0.302 per brick	$ 756.27
1 mason, 8 days, at $8 per day, lining mill	64.00
*1 mason, 10 days, at $8 per day, chipping bricks	80.00
2 helpers, 10 days, at $4	80.00
10.75 bbl. 'Heidelberg' cement, at $12.48 per bbl.	134.16
Sharpening tools	2.03
	$1,116.46

*This lining was composed of 2½-in. blocks set on edge to make a 4-in. lining, as there happened to be a large stock of the thinner bricks on hand. This made the lining unusually expensive. The mill was shut down 13 days for re-lining. The old lining wore down unevenly, being less worn at the tail-end of mill. The average thickness, when chiselled off from the shell, was about ¼ in. In places the thin cement-bedding had worn down to the shell of the mill.

The cost of filtering by the Butters process for the months of March, April, and May, 1908, was:

Labor: 1 man per shift, at $4, with occasional extras.

Maintenance and repairs: on filter leaves, filter-boxes, and pumps.

Acid: hydrochloric acid, for washing leaves.

Power: 42 hp. for operating circulating-pump, vacuum-pump, and stirrer in pulp-tank, at $8 per hp. per month.

SUMMARY.

	Labor.	Maintenance and repairs.	Acid.	Power.
March	$ 382.50	$ 6.75	$165.93	$ 336.00
April	360.00	259.06	163.43	336.00
May	364.00	142.60	160.43	336.00
Totals	$1,106.50	$408.41	$489.79	$1,008.00

Total tonnage for three months, $13,462.
Average per day filtered, 146 tons.

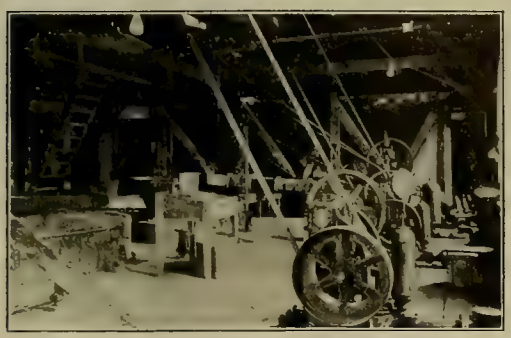
Labor per ton	$0.082
Maintenance and repairs	0.030
Acid per ton	0.036
Power per ton	0.082
Per ton of ore filtered	$0.230

CONSUMPTION OF CHEMICALS IN CYANIDE PLANT.
Pounds per ton of ore.

	Cyanide.	Zinc.	Lime.	Lead acetate.	Hydrochloric acid.
Oct., 1907	4.98 KCy	0.91	8.64	*	*
November	2.40 KCy	0.90	7.50	*	*
December	2.09 NaCy	0.81	8.29	0.21	0.14
Jan., 1908	2.11 KCy	1.19	8.63	0.27	0.19
February	1.80 NaCy	0.76	8.32	0.31	0.33
March	2.05 NaCy	0.96	7.70	0.31	0.39
April	2.48 NaCy	1.14	8.20	0.31	0.40
May	1.98 NaCy	1.10	7.55	0.27	0.40

*None used.

It may be stated that although this mill has made



Pump Room, Cyanide Plant, Montana-Tonopah Mill.

the record on costs for this district, all the costs are in reality high. Water, power, and labor are expensive items, and freight rates are exorbitant. It would therefore be idle to compare these conditions with those obtaining in other countries, as in Mexico, for example. The following figures are offered merely

Zinc-dust Precipitation Presses.
Showing part of cake in place at time of clean-up.

to illustrate a few of the difficulties incident to milling operations in Nevada:

	Tonnage treated.	Cost per ton, milling and cyaniding.
October, 1907	4120	$4.25
November	4410	3.79
December	4256	3.58
January, 1908	4135	3.59
February	4383	3.59
March	4701	3.28
April	4303	4.08
May	4458	3.67

These figures do not include insurance and depreciation on plant.

In explanation of the above costs, the following items may be of interest:

Average cost of water per ton of ore treated	$0.287
Average cost of power per ton of ore treated	0.808
Average cost of labor per ton of ore treated	0.943
Total	$2.038

Crusher-men, battery-men, concentrator-men, and

Butters-Filter Plant.

solution-men receive $4.50 per shift of 8 hr.; filtermen, $4; laborers, $4; and carpenters, $6.

EXTRACTION.
(By concentration and by agitation in cyanide solution.)

	Average mill-head.		Average tailing Butters filter.		Extraction by bullion-yield.		
	Gold, oz.	Silver, oz.	Gold, oz.	Silver, oz.	Gold, %	Silver, %	Total %
Oct., 1907	0.153	15.54	0.0039	2.18	97.55	85.5	88.76
November	0.135	14.97	0.0084	2.36	94.30	84.6	87.40
December	0.133	13.90	0.0080	2.14	94.30	85.4	87.70
Jan., 1908	0.163	16.34	0.0106	2.41	94.00	86.6	88.50
February	0.186	18.36	0.0105	2.01	93.50	88.0	89.40
March	0.240	23.66	0.0140	3.09	93.80	86.9	88.80
April	0.206	20.20	0.0100	1.64	95.20	89.7	91.10
May	0.219	20.44	0.0129	2.28	93.40	88.6	89.80
June	0.172	16.67	0.0110	1.80	93.40	89.7	90.60

Of this extraction approximately 40% is obtained by concentration, and the remaining 50% by cyanidation.

Coke production in the United States in 1907 amounted to 40,779,564 short tons, valued at $111,539,126, a total that passes all previous records in the history of coke-making in this country, being nearly double the output of 1900, and more than three times that of 1897. The increase over the production of 1906 was 4,378,347 short tons, or 12.02% in quantity, and $19,931,092, or 21.76% in value. The average price per ton at the ovens, $2.74, is greater by 22c. than the 1906 average, and is the highest reported in the 28 years during which statistics of coke production have been compiled by the U. S. Geological Survey, exceeding by 11c. the maximum rate previously obtained in 1873.

Alumina in silicates is subject to unexpected error in analysis, as shown by Hinrichsen. On decomposing silicious minerals with HF and H_2SO_4 and subsequently conducting the analysis on the silica-free residue, a deficiency in Al_2O_3 was noted, which was found to be due to partial volatilization of the Al as a compound with fluorine. Some fluorine also was retained in the mineral.

THE NATION'S DEPENDENCE UPON NATURE.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE OTIS SMITH.

*President Roosevelt's State papers have again and again contained stirring appeals to the lawmakers to make adequate provision for the conservation of the nation's natural resources. No other Chief Executive since Washington has given equal prominence to this sort of practical statesmanship. He has seen clearly that American natural wealth is not inexhaustible. The President's well-considered appeal should arouse a new type of patriotism no less than did Lincoln's call to arms inspire a new devotion to the nation. It was not a frenzied alarmist, but a hard-headed man of science who wrote that "future historians will date the end of barbarism from the time when generations begin to feel that they rightfully have no more than a life-estate in this sphere, with no right to squander the inheritance of their kind." The reform that is so sorely needed must gain its motive-power not from the well-intentioned enthusiasm of the few, but from the well-informed intelligence of the many. The campaign for conservation must be one of education. The United States leads the world in every important form of natural wealth, whether it be the product of the farm or of the mine. Our wheat crop forms 21% of the world's harvest, our corn crop 78, and our cotton crop 82%. So, also, in the matter of live stock, our herds and flocks comprise 17% of the world's grand total. To take the more important minerals, our output of coal is 40% of the world's production, of copper 50, of iron-ore and oil at least 60%. The increase in our per capita production and consumption of natural resources perhaps furnishes the best index of the increasing dependence of the nation upon its natural resources. At the outbreak of the Civil War the per capita consumption of coal in this country was only a little over one-half ton; in 1900 it was 3½ tons; but in 1907 the consumption had increased to 5½ tons. In 1850 our per capita consumption of lumber was 250 board feet; today it is undoubtedly close to 500 board feet. In 1870 our per capita production of iron-ore was 160 lb.; last year it exceeded half a ton.

The most valuable of all natural resources are water and soil. No more attractive field for increasing the country's available wealth lies before us today than that of determining the possibilities of our rivers and streams. Here we shall find the solution of the problems of improved inland water-transportation, successful agriculture, cheap power-development, and adequate protection from floods. The rivers of Maine now turn wheels that furnish a total of somewhat more than 210,000 hp., and with proper storage facilities the full development of her water-powers might yield 1,200,000 hp. This conservative estimate of the importance of Maine's water-power is a fair index of the value of the nation's water-resources, by far the larger part of which is yet undeveloped. Great soil-loss is occasioned by tillage methods which permit sufrace washing. The soil-waste thus started by mere negligence increases until the slopes are gullied, the bottom lands covered with waste, the streams choked, and the navigable rivers filled with bars. So universal and persistent is this drain upon our resources that it is estimated that at least one billion tons of the nation's richest soil is annually carried into the sea by our rivers. The subjects of soil and water-resources cannot be discussed without mention of the conserving influence of the forest. The records of flow of many rivers too plainly show the effect of removing the forest-cover. There is a vital relation between the forest and agriculture, manufacture, and navigation. As the great conserver of other resources the forest deserves the nation's care.

Recent surveys of the nation's coalfields indicate an area for the more accessible coals of 327,000 square miles. This is four times the area of the known coalfields of the rest of the world. In these vast coalfields the nation has available nearly 2000 billion tons of coal mineable under present conditions, or twice the tonnage estimated for the rest of the world. Apparently America's supply is so great as to render immediate alarm unnecessary, but if the present phenomenal rate of increase in consumption is maintained, the supply of easily and cheaply mined coal will be gone before the middle of the next century. The waste of our natural gas supply has been estimated at 1,000,000 cu. ft. daily, or the equivalent of 10,000,000 tons of coal per year. Nor is the record for petroleum much better. In the case of coal there is waste at every stage of mining and consumption. For each ton of merchantable coal brought to the surface at least half a ton is wasted by being left in the ground, or thrown upon the culm pile. Great also is the loss by uneconomical consumption. Less than 10% of the heat units of coal are utilized under the ordinary steam boiler, and in the locomotive the waste is said to be not less than 95%. The record of waste, however, before which every American should stand aghast is that of human life in the coal mines. So far reported, with several States unheard from, 3124 coal miners were killed last year, or an increase of 50% over 1906. It is a matter of some gratification, however, that at last the nation has made some provision for investigations that may prevent or lessen mine disasters.

The iron-ore production last year, reaching 51,000,000 tons, shows an increase of 8% over 1906 and 21% over 1905. Even should the present output continue without further increase, the known reserves will be exhausted within the present century.

The future of metal mining will be governed by the improvement of metallurgical and mining methods and by the available supplies of fuels, water, power, and mining timber, as well as by the discovery of new mining districts. In the determination of the economic value and availability of ore deposits, the fuel and water supply is a more important factor than the character of the ore itself. In a real and large sense the very life of our mining industry depends upon the conservation of all the other natural

* Abstract of Phi Beta Kappa oration of George Otis Smith, Director U. S. Geological Survey, at Colby college, Waterville, Maine.

resources. Private ownership of natural resources is a form of stewardship, and the duty of man to man and of the present to the future is being recognized as never before. No clearer exposition of this truth has appeared than in the recent opinion of the Supreme Court of Maine, wherein it is set forth that as ownership in land is not the result of productive labor, but is derived solely from the State itself, which was the original owner, and as the land resources are incapable of increase, the State has the right to protect itself against the impoverishment that would follow waste under private ownership. So indicative is this opinion of the national awakening that President Roosevelt devoted a large part of his memorable address on conservation to the Maine decision. A month later the Supreme Court of the United States enunciated a similar principle. These decisions of the highest courts are 'signs of the times' and mark the dawning of an era of conservation. The policy of leaving "to the next generation the national honor unstained and the national resources unexhausted" is the key-note of the new patriotism.

Mercury in ores may be determined accurately by a method set forth by Muller (*Bull. Soc. Chim.* [4], I., 1169), as follows. When Au and Pb (one or both) are absent, treat an amount of the pulverized ore which is estimated to contain about 1 gm. Hg, with aqua regia in a covered capsule at a gentle heat. After decomposition, evaporate to dryness at about 50°C. Take up with hot water, add about 50 c.c. of a 20% solution of KI and then Na_2CO_3 until it produces no more precipitate. Add a little NaOH to obtain positive alkalinity. Filter, wash with hot water, and extract the insoluble portion with more KI and Na_2CO_3. The extract and washings should come to about 100 c.c. and will contain all the Hg. The test is made on aliquot portions of this, using for 0.1 gm. Hg 20 c.c. of a 20% NaOH solution, and the same amount of formaldehyde, 35%, in stoppered flasks for about 20 hr. at 25°C. Metallic Hg is precipitated, which may be washed by decantation with alcohol, and then N/10 I in excess (known amounts) is added, and the flasks set aside in the dark until the Hg has been dissolved. If it has collected in large globules, the cautious application of heat may prove necessary to effect solution. The excess of I is then determined by means of standard $Na_2S_2O_3$.

Coal production in California during 1907 was the smallest reported in the State since mining began in 1861, according to E. W. Parker of the U. S. Geological Survey. The increased production of petroleum and its use for fuel purposes has had a demoralizing effect on the California coal industry, and except for domestic purposes there is little market for the product. From 77,050 tons in 1905 the coal output decreased to 22,290 tons in 1906; in 1907 the total production was but 13,950 tons, valued at $38,213.

Acetylene lamps have been used instead of candles in a number of mines in the West. It is claimed that the cost of lighting is reduced more than one-half, and that at least six times as much light is obtained.

RUSTING OF IRON.

Written for the MINING AND SCIENTIFIC PRESS
By F. H. MASON.

In the *Proceedings* of the Chemical Society, issued on June 29, 1908, are the conclusions W. A. Tilden has drawn from experiments that he has been conducting over a considerable period on the rusting of iron. They are:

"1. Oxygen or air, with liquid water, are alone necessary to produce rusting without the assistance of carbonic acid, failure on the part of other experimenters to produce rusting in iron prepared by treatment with chromic acid being probably due to 'passivity.'

2. Water alone in the absence of oxygen attacks iron slowly, producing a film of what is probably ferrous hydroxide, as it is wholly converted into brown rust on the admission of pure oxygen. In this connection the experiments of Whitney (*Journal* Amer. Chem. Soc., 1903) repeated and approved by Walker, Cederholm, and Bent (*Journal* Amer. Chem. Soc., 1907) were confirmed.

3. Iron-rust, even when old and constantly exposed to the weather, always contains ferrous oxide.

4. The process of rusting is due in the first instance to electrolytic action, promoted in all ordinary cases by the existence of carbonic acid in water exposed to air, and by the presence in iron of various compounds of carbon, silicon, phosphorus, and sulphur. That electrolytic action does occur locally in all commercial iron, whether malleable or cast-iron, or steel, immersed in water, is shown by the use of the 'ferroxyle' indicator (phenolphthalein and ferricyanide) introduced by Walker and his colleagues. In ordinary rusting the process is also assisted by the depolarizing action of the layer of ferric oxide or hydroxide formed externally on the rust-spot."

The subject is eminently interesting to engineers, more particularly in its relation to feed-water for boilers, and in the pumping of corrosive waters either from mines or in hydro-metallurgical plants. Mr. Tilden has disturbed one theory of long standing, namely, that pure water and air are without action on metallic iron. By his experiments he distinctly proves this not to be the case, but that while carbonic acid greatly accelerates the rusting of iron, rusting may be initiated not only by pure air and water, but by pure water alone. The generally accepted theory of rusting was that while it might be initiated by many accidental atmospheric impurities, it was generally started by carbonic acid. Once the rusting had commenced it was continued by the two hydrated oxides of iron working upon each other and upon the iron on one side, and the air on the other, thus on the side adjoining the iron we find ferric oxide being reduced by that metal to ferrous oxide, while the latter becomes oxidized to ferric oxide by th eair on the side remote from the iron. Hence, given the condition of a moist atmosphere, the reactions go on continually until the metal is completely oxidized. Mr. Tilden's third conclusion is only what we should expect, for while there is metallic iron there will assuredly be ferrous oxide.

The second part of his fourth conclusion is perhaps the most interesting, namely, that carbides, silicides, phosphides, and sulphides of iron, which exist to a greater or less extent in all forms of iron and steel, are in the presence of pure water, or of pure water and air, capable of promoting electrolytic action, and initiating rust. It would have been even more interesting if Mr. Tilden could have gone farther, and stated whether there was any direct increase of electrolytic action in proportion to the amount of metalloid present in the iron. When the Hub mine in Cape Breton, Canada, was re-opened about 15 years ago, after being closed for 20 years, the iron pipes and tee-rails found, while retaining their original shape, had been entirely converted into a soft material which could be scraped with a pen-knife and cut with a carpenter's saw. I made a number of analyses of this substance at the time, but unfortunately have retained no copy. I remember, however, that it contained a little over 50% iron, none of which was in the metallic form, but mostly existing as ferrous and ferric oxide, with a little sulphate and sulphide. There was also about 12% graphitic carbon, 3% phosphorus, and considerable silica. The coal in the mine is high in sulphur, and the mine-waters probably contain sulphuric acid, which would form an excellent electrolyte. The carbon must have replaced iron to some extent, and was presumably derived from the coal. The original casting could certainly not have contained as much carbon as found. The fact of the castings having retained their original form is curious. For a long time difficulty was found in pumping at this mine owing to the corrosive action of the water on the pumps. That electrolysis plays a part in the 'pitting' of boilers has been known to chemists for a long time, but it has been generally supposed that the boiler-mountings, which are usually made of copper-zinc, or copper-zinc-tin alloys, were responsible for the promotion of the electrolysis. Some years ago I conducted a large number of experiments on boiler feed-waters. The waters were found to 'cut out' a set of boiler-tubes within six months, and the matter was placed in my hands for investigation. The source of the water was a lake supplied by a large watershed of uncultivated land. The water in passing through dead and decomposing leaves, and roots of trees, shrubs, and other plants, became highly impregnated with vegetable matter. There was practically no mineral matter, analysis showing less than three parts per million. The oxygen-absorption, as shown by Tidy's modification of Forchammer's test amounted to over six parts per million. In determining the amount of iron attached—it cannot be said to be dissolved—weighed quantities of the best Swedish iron-wire were placed in a large hard-glass flask, in which known quantities of water were evaporated over regular intervals of time. At first spots would appear on the wire, followed by brown fungus-like growths, which were undoubtedly composed of hydrated oxides of iron. The ebullition would ultimately detach these, and others would form in their places. At the end of the experiment the wire was taken out, carefully wiped to remove adhering oxide, rinsed first in distilled water, then in alcohol, dried at 100° C., and weighed. Viewed under the microscope big holes were found where the fungus-like objects had formed. The other parts of the wire were apparently unattacked. When small pieces of brass wire were intertwined with the iron wire, to imitate boiler mountings, the wire blackened over the whole length before the water boiled, and oxide formed all along it. Microscopic examination showed that while the wire had been attacked along its whole length, the attack had been much more violent in some places and especially at the points where the brass wire was intertwined. The weighing showed over three times the loss of iron when the brass wire was in contact with the iron wire. A large number of experiments were made before a satisfactory antidote was discovered. Ultimately the addition of bichromate of potash was found to solve the problem. The amount added was small, and the cost of the reagent amounted to only three cents per day per hundred horse-power. It entailed some initial outlay in the way of storage-tanks in which the water and reagent were mixed, but it formed an efficient remedy.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

S. J. B., Raymond, Cal.: No. 1, calcite crystals.

E. O. S., Tucson, Ariz.: No. 1, mica-schist; No. 4, aplite; No. 7, silicious breccia with traces of copper.

H. P. W., Blake, Cal.: No. 2, quartz and limonite deposited in a wholly altered rock. Should be assayed for gold.

C. G. S., Silverbell, Ariz.: Basic diorite with disseminated pyrite.

G. A. D., Nelson, Nev.: No. 1, pyrite and sphalerite in quartz; secondary calcite and some remains of altered rock shown by chlorite; sphalerite in the dark-brown mineral; No. 2, fine-grained rhyolite; No. 3, white sandstone.

O. G., Blair, Wis.: Silicious sinter (hot spring deposit) colored red by arsenic sulphide.

J. C. S., Jerome, Ariz.: Pyrite crystals imbedded in a talcose mass resulting from rock decomposition.

A. S., Orient, Wash.: Black hornblende and brown mica crystals set in a fine-grained aggregate of vitreous green pyroxene, the whole traversed by veins containing quartz and feldspar.

C. H. C., Olalla, B. C.: No. 1, diorite with secondary pyrite; No. 2, quartzite; No. 3, a thoroughly decomposed rock, now a sintery silicious mass; No. 4, basic andesite, may be part of a diorite mass, field relations govern; No. 5, hornfels (a compact chert-like lime silicate resulting usually from contact-metamorphism along beds of limestone).

A WATER-WHEEL GOVERNOR AND ITS OPERATION.

Written for the MINING AND SCIENTIFIC PRESS
By D. BEN REPLOGLE.

Water-wheel governors differ from steam governors in the greater strength and more complex duty required of them. They control water under pressures varying from 3 to 900 lb. per sq. in. They may have duty of 20 up to 30,000 foot-pounds per second; and a 10-hp. wheel may require a stronger governor than a 10,000-hp. wheel, depending upon the volume, pressure, and character of the 'water-shift,' that is, the gates, nozzle, or deflector controlling the stream that enters the wheel. Where the water-shift cuts off the flow instead of deflecting it, changes of pressure result, due to the governor's own action. This and the great strength required, as well as the great range of adjustment incident to varying conditions, have together necessitated a heavy governor of rather complex construction.

In the governor illustrated herewith an attempt

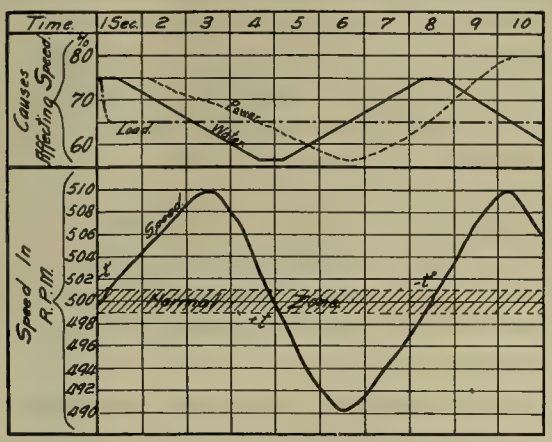


Fig. 1.

has been made to reduce the parts to the simplest form consistent with complete efficiency in performance. The centrifugal balls revolve in a belt-drive wheel and cause the flat discs on the main shaft, by endwise motion, to engage for plus or minus water-shift, according as the speed deviates from the normal. The endwise motion of the shaft is not in excess of $^1/_{64}$ in. The shaft is hollow, having a rod extending through its centre and engaging a lever at the end opposite the belt-wheel in such a manner that any swinging of the lever changes the position of the fulcrum of the fly-balls slightly, so as to afford a variation of the speed at which they will 'trip' or cause engagements of the discs. This lever is operated or shifted in its range by means of a horizontal rod actuated by a worm, or cam, moving with the water-shift, and the rod is automatically adjusted in its length by means of a screw, driven by a variable-speed mechanical drive, so as to properly time the engagements as to duration and also to properly vary the tripping-speed of the governor. It will be more readily understood what movements a governor must make by examining the accompanying diagrams. These diagrams apply to the performance of any make of governor, and they attempt to make clear the part of a governor's performance that is complex and obscure to most operators of water-power plants. While the diagrams show the work of three types or grades of machines, the governor illustrated, as well as any high-grade governor, must be adjustable to the work (as indicated in Fig. 2) or to any modifications re-

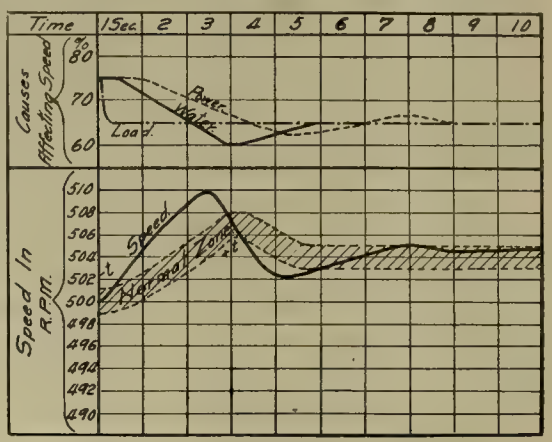


Fig. 2.

quired of it. On this account, it will be understood, destructive racing could occur on account of failure to properly adjust a high-grade machine. The submitted diagrams are intended to indicate the performance of each of three grades of governors under a 10% instantaneous drop of load. Fig. 2, however, may be illustrative of the performance of a high-grade governor, wrongly adjusted, or adjusted for special compensation. Fig. 1 more especially indicates the performance of a non-compensating governor, that is, one which does not automatically vary its own tripping-speed to meet conditions. Its normal speed remains level at 500 r. p. m.; therefore it will remain in action as long as the deviation of the curve is outside the narrow limits 499-501, which

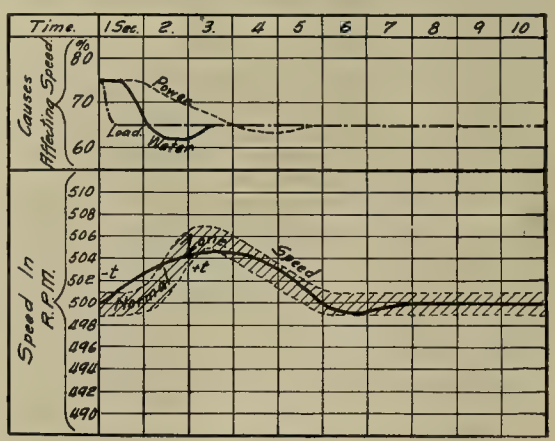
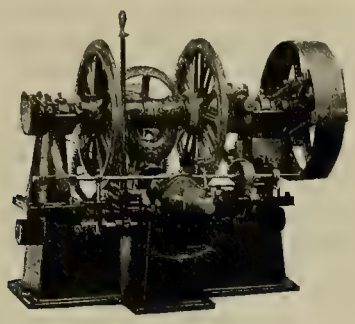


Fig. 3.

are its plus and minus tripping-points. This performance is nearly always improper in a quick-acting governor, for each engagement is too long, and 'hunting' is the result. If the speed-curve coincided with the normal zone when the water-shift

and load coincide, as at the beginning of the third second, it is evident that no further 'trip' of the governor would result. The power-effect occurring subsequent to water-shift, however, and the speed being dependent on and coincident in time with the power-effect, the speed and load-curves cannot harmonize without compensation.

In Fig. 2 it will be noticed that provision is made for cutting shorter the time of minus trip (and minus shift) due to a drop of 10% of load. The speed reaches the same deviation, 510, as shown in Fig. 1, but the normal zone has been automatically shifted upward by the action taken, and the speed coincides with normal at the end of the third second instead of at the end of the fourth second, as in Fig. 1. The position of the water-shift is such, however, as to cause the speed to continue to fall so that a plus-trip results at the beginning of the fourth second. This causes the water to coincide with the load at the end of the fifth second. This also again shifts the normal zone downward, and thus causes the plus-trip to terminate earlier. This is the compensation which makes the governor satisfied in the sixth second, but the normal speed now remains at 505 r. p. m., and in like manner there will be a varying normal speed, corresponding to all load-variations and water-shift positions. The appliance in a governor producing this characteristic is called a compensator.



Water-Wheel Governor.

It will now be possible to clearly understand the performance indicated in Fig. 3. Here a quicker action on water-shift is permissible because of the extraordinary feature which is introduced, of having the normal-zone shifted rapidly with the speed-curve and automatically returned to its original level at a rate corresponding to the speed-return. This performance allows a plus-trip to occur when the speed is at its highest, and, as shown, this brings the desired tranquilization at level-speed in the fifth second. This shifting of normal-zone and tripping-points then causes the governor to properly select and time its action, even though the speed at the time would, as in case of Fig. 1, cause it to take, or continue in, a contrary action. This is a performance which has been said to savor of human judgment. No man on the water-shift, however, could equal its results in regulation. The appliance in the machine to which this performance is due, I prefer to call a 'tranquilizer.'

Racing, or 'hunting,' as the phenomenon shown in Fig. 1 is usually called, may be due to many other causes than misadjustment of the governor; or, more properly speaking, the defects of the plant outside of the governor may be so extensive that no adjustment of the governor will compensate for them. Among these defects are: lost motion in connections; sticking gates or nozzles; extreme variations of pressure; uneven power-effects at various stages of water-shift; and unbalanced gates or nozzle. Some of these can be met by adjustment of the compensator and tranquilizer, but when the strength of the governor is not adequate for the conditions in hand, and when it has not a fair surplus for emergency, the governor should be discarded as dangerous, and a stronger one substituted. A weak governor or a defective one, failing to act promptly, will consequently overrun when cause accumulates, and the most dangerous hunting or 'runaway' may result.

I have found governors installed which were adjusted sixteen times too quick and others forty times too slow. The former caused a very rapid hunting, the water-shift moving 100% in half a second. The result was an even speed, but an over-tax on the governor. It was corrected by changing a gear in the connections. Where the governor was too slow, a great deviation of speed occurred, but no hunting. A change of governors was necessary. Sensitiveness is not synonymous with quickness. Sensitiveness results from close adjustment of flyball-connections and friction-discs. A narrow normal-zone indicates sensitiveness; a steep water-curve, quickness. Where a safe margin for strength is allowed, and a good type of tranquilizing governor, having a wide range of adjustment, is selected, it will lead to safety and economy in the plant, indispensable under modern demands.

Iron-ore production in the United States during 1907 amounted to 51,720,619 long tons, according to an advance sheet of the Mineral Resources recently issued by the U. S. Geological Survey. This ore had a value of $131,996,147 at the mines. As compared with the production of 1906, the most productive previous year, this was an increase of 8.32% in tonnage and of 31.21% in value. Reports of production in 1907 were received by the Survey from 169 mines, the maximum production of any one mine being 2,900,624 tons, this being the Hull-Rust mine, in Minnesota. Ten mines, all except one being situated in Minnesota, produced over 1,000,000 tons each. The million-ton mine not situated in Minnesota was the Red Mountain, of Alabama, which during 1907 produced 1,370,849 tons, and ranks seventh in the list of producers. During 1907 the United States imported more than 1,200,000 long tons of iron ore. Of this total over half was from Cuba and about a third from Spain. About 116,000 tons came from British North America. Exports during the year amounted to 278,208 long tons, a slight increase over the exports of 1906. The bulk of these exports represent Lake Superior ores shipped directly from American mines to Canadian furnaces.

There are more than 318,000 miles of railroad in the United States.

ASSOCIATION OF MAGNETITE WITH SULPHIDES IN MINERAL DEPOSITS.

Written for the MINING AND SCIENTIFIC PRESS
By JOHN B. HASTINGS.

In the MINING AND SCIENTIFIC PRESS of November 9, 1907, was an article by Geo. J. Bancroft touching on three subjects: the formation of gossan in a moist climate and lately glaciated country; the contemporaneous deposition of magnetite and sulphides; and the solubility and leaching of gold in the oxidized upper portion of a quartz vein. The first and third conditions have been ably discussed in the Transactions of the American Institute of Mining Engineers by T. A. Rickard and other prominent engineers, and by H. V. Winchell, whom Mr. Bancroft quotes. Quite a little, too, has been said about the intimate association of magnetite with various sulphides, but the references have been overshadowed by larger and more valuable information accompanying them on other points. Six years ago I passed through the same stage of wonderment as Mr. Bancroft over the genesis of the blond and dusky minerals, when examining like deposits in Alaska, though already pretty well seasoned to the anomaly by previous residence in British Columbia. Since then I have followed with interest the opinions of the sophisticated on such occurrences. There is no one particular article dealing prominently with the relations between magnetite and sulphides, but the following quotations show partially what a half-dozen of the leading authorities think about it. There are other views on the origin of some of the magnetites of the Eastern States, which are not included, as the conditions are dissimilar to the Western phase.

A. H. Brooks,[1] speaking of the deposits on Kasaan peninsula, Prince of Wales island, Alaska, which are principally magnetite, with chalcopyrite, pyrite, some gold, and a little silver, says (p. 98): "In some of the mine-workings the percentage of magnetite decreases very rapidly below the surface. In these the place of the magnetite is taken by copper and iron pyrite, showing that the occurrence of the former mineral depends upon the alteration of the sulphide minerals near the surface. In certain of the thin sections examined under the microscope, pyrite grains were observed surrounded by secondary magnetite." The ores of the region consist of copper pyrite, with some bornite, closely associated with iron pyrite and magnetite. "The gangue, as far as there is any, includes amphibole, epidote, vesuvianite, and considerable calcite, together with chlorite and jasper," and a little quartz. Present knowledge of these deposits is too meagre to admit of saying much as to their origin, but it suggests analogy with magmatic differentiation. "There has undoubtedly been mineralization subsequent to the cooling of the rock in which they are contained."

I had the opportunity, just after Mr. Brooks finished his studies, of examining some of the most important of the Kasaan peninsula magnetites, though without time for anything more than to obtain direct economic results. The orebodies occur alike in limestone and greenstone, usually in the latter, and in neither rock does it show well-defined fissures. One orebody which was sampled, 200 ft. long and 50 ft. wide, was bounded on four sides, respectively, by white limestone, blue limestone, greenstone, and a light-colored dike (undetermined). All four contacts between the ore and the rocks were clean and well defined and almost perpendicular. The average analysis was 45% iron, 15 silica, 10 sulphur, 5 alumina, 5 magnesia, 2 lime, and in part 2.5% copper, and 15% oxygen with the magnetite. The chalcopyrite occurs in spots throughout the magnetite, so that when the solid magnetite is broken the copper is seen through the entire mass and not as films along the planes. The other half of the iron body contains more epidote and chlorite. It was thought to be a replacement of blue limestone. The neighboring greenstones were similarly replaced as an extension of the ore-zone. This means a substitution of the ore minerals for the original constituents of the limestone and greenstone, probably from solutions ascending along favorable lines—joints, bedding-planes, contacts, and fracture-planes, and then gradually spreading. It also means an able-bodied carrier, undoubtedly water.

W. Lindgren,[2] describing the deposits of Clifton-Morenci, Arizona, says: "Magnetite, pyrite, chalcopyrite, and zinc-blende accompany in various proportions the contact metamorphic minerals, and are intergrown with them in such a way that the contact metamorphic origin of these ores appears beyond doubt," resulting from "water and metallic substances which were originally contained in the magma of the porphyry . . . released by decreasing pressure. . . . We may thus speak of these deposits as contemporaneous with the cooling and solidification of the porphyry." They are more or less irregular in form, influenced by stratification-planes and dikes acting as boundaries. The fissure-veins seem to have been formed a short time after the consolidation of the porphyry. (p. 21) "In the lower levels the veins consist of pyrite, chalcopyrite, and zinc-blende, magnetite being conspicuously absent."

This is perhaps slightly modified on page 98, where he says: "Fissure veins in limestone are accompanied by quartz, magnetite, and amphibole, as metasomatic minerals," and on page 28, ". . . metamorphism resulted in metasomatic development of garnet, epidote, diopside, and other silicates, accompanied by pyrite, magnetite, chalcopyrite, and zinc-blende. The sulphides are not later introductions, but contemporaneous with the other contact minerals. The contact zone has received very substantial additions of oxides of iron, silica, sulphur, copper, and zinc, enough to form good-sized deposits of pure magnetite and low-grade deposits of chalcopyrite and zinc-blende." Again (p. 102), "Magnetite . . . in great quantities appears in the contact metamorphic limestones and dolomitic limestones, where it is associated with garnet, amphibole, pyroxene, and sulphides. In structure it is usually granular, but when disseminated in limestone it also occurs in crys-

[1]Preliminary Report on the Ketchikan Mining District, Alaska, etc., U. S. G. S. Prof. Paper No. 1, 1902.

[2]'Copper Deposits of Clifton-Morenci District, Arizona.' U. S. G. S. Prof. Paper No. 43, 1905.

talline form. It is found wherever contact-metamorphic alteration has taken place; especially large masses, economically important as flux for smelting purposes, occur in the Manganese Blue and Arizona Central mines, as well as on the hill slope southwest of the latter mine. A large body also occurs in the gap where the road to Eagle Creek descends into the Gold Gulch valley. To a minor degree it is also formed as a metasomatic product in limestone, rarely in porphyry, along the walls of the fissure veins which cross these rocks. It alters to limonite, and sometimes also to hematite, as is well shown in the iron stopes of the Manganese Blue mine. . . . Metasomatic processes are those by which, through chemical reactions, and mainly by aid of water, one mineral is changed into another. . . . Rocks are metasomatic if any or all of the constituent minerals have undergone partial or entire metasomatic changes. . . . In contact metamorphism . . . the principal minerals formed are garnet, epidote, wollastonite, pyroxene, amphibole, magnetite, and pyrite in the limestone, and amphibole, epidote, feldspars, biotite, andalusite, and quartz in clay shales. . . . These changes . . . are usually attributed to the combined influence of heat and magmatic water pressing outward from the cooling intrusive rock. . . . Hydrothermal metamorphism is a form of alteration in most cases confined to the close vicinity of fissures. Much of the ore may be produced in this manner by replacement of country rock. The minerals most commonly formed in this district are pyrite, sericite, calcite, and quartz, but it will be shown that magnetite, pyroxene, amphibole, and epidote may also be formed by these agencies . . . ." In descriptions of individual localities, summary and discussion, etc., not included in this article, he says: "Magnetite . . . oxidizes at the surface to hematite, which is usually loose and cellular, and black from accompanying peroxide of manganese. Limonite is the final product. Near fissures and in orebodies in altered limestone the oxidation of magnetite may proceed to a depth of 200 ft. or more."

S. F. Emmons,[3] speaking of the ores near Greenwood, British Columbia, says: "The association of magnetic oxide of iron, in considerable amount and of contemporaneous formation, with sulphides of iron and copper (more particularly the latter), is a peculiar occurrence I had never had occasion to observe until last summer." The type is similar to Lindgren's contact deposits, except for the apparent absence of eruptives in the immediate vicinity.

W. H. Weed[4] quotes R. W. Brock on the same mines—and I take it that Brock had no doubt about the simultaneous deposition of the magnetite and sulphides: "Brock distinguishes two types, a pyritic, characterized by pyrrhotite, with chalcopyrite and iron pyrites, and a magnetite type, with magnetite and copper pyrites. Though segregated in places, the chalcopyrite is remarkably evenly distributed through the deposits. Rarely do magnetite and pyrrhotite occur in the same deposit. . . . Brock considers the orebodies to be composite veins formed by mineralizing solutions traversing the country rock, principally along fissures or zones of fissures in which they deposit the economic minerals, and from which they replace with their mineral contents, particle by particle, sometimes completely, the original material of the country rock."

A. C. Spencer,[5] describing the Treadwell mine, Alaska, says: "Magnetite occurs only in the form of minute grains outside the veinlets. Part of it appears to have been an original constituent of the diorite, but much of it was deposited secondarily along with the pyrite, perfect cubes of which it sometimes surrounds." These veinlets are infiltrated materials making up one-fifth of the mass of the altered diorite constituting the Treadwell ore deposit.

W. Lindgren[6] also says that, "Magnetite also occurs with epidote and pyrite, as probably segregation-masses leached from the surrounding rock, in the tunnel of the North Star placer mine . . ." at Grass Valley, California.

J. F. Kemp[7] describes a Mexican deposit, saying: "The ores are probably caused by an intrusion of diorite porphyry, in Cretaceous(?) fine-grained bluish limestone. Contact effects have changed the limestone to white marble, garnet, and other lime silicates. . . . Magnetite is a contact-mineral locally developed in irregular masses which are of very considerable size. On the borders they are intermingled with garnet and diopside, and throughout the magnetite are abundant veinlets of chalcopyrite and pyrite. . . . The magnetite must have been introduced in the same way as have the silica and alumina which have developed the silicates. . . . In the cooling of the eruptive there must have been a stage when the emissions were of necessity gaseous, and a later stage when they were liquids. . . . In his study of the Clifton district, Mr. Lindgren has attributed the garnets and other silicates to the stage of gaseous emissions, particularly of water-gas accompanied by silica and iron. This is quite reasonable, and it may be that at San José the garnet-zones, the magnetite, and the copper ores were formed at this time. From the evidence in hand, however, there seems no reason to eliminate heated waters as also possible agents. . . . The bodies of magnetite were doubtless formed by direct replacement of the limestone with the iron oxides, and seem to indicate a local richness in iron for the emissions from the eruptive where they are found . . . There is slight, if any, reason to regard them as other than purely contact-products. . . . The introduction of the sulphides seems to have been, in largest part, one of the later phases of the contact-metamorphism, and to have followed the production of the silicates at least in part. We infer this from the relations described under the sulphides that, besides forming inclusions in the silicates, they mold around the garnets, and follow crevices in the magnetite."

(To be Continued.)

[3] 'Genesis of Ore Deposits,' Special volume A. I. M. E., 1901.
[4] 'Ore Deposits near Igneous Contacts,' Trans. A. I. M. E., Vol. 33, 1903.
[5] 'Geology of the Treadwell Ore Deposits,' Trans. A. I. M. E., Vol. 35, 1905.
[6] 'The Gold-Quartz Veins of Nevada City and Grass Valley Districts, California.' U. S. G. S., 17th Ann. Rep., 1896.
[7] 'The Copper Deposits of Tamaulipas, San Jose, Mexico.' Tran. A. I. M. E., Vol. 36.

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EDITORIAL.

AT A RECEPTION in San Francisco on Tuesday night Mr. E. H. Harriman revealed how the denunciation and legal prosecution which have followed him and many of his enterprises in recent years, have rankled in his bosom. "We do not want to be regarded as a machine, but we would be treated as human," were his words. But there is the crucial point. Had Mr. Harriman recognized that the railroads are national and not individual arteries of commerce; had he taken to heart the full significance of the law constituting railroads 'common carriers,' with right to invoke in their behoof the high governmental prerogative of eminent domain; had he realized that so-called private 'ownership' in railroads can, in the nature of the case, be nothing more than a trusteeship; then he would have made the management of the railroads under his control as mechanical as the discipline that gives him efficient service from his employees, and as free from the bias and unjust discrimination of an unmechanical, humanly wilful administration, as he possibly could. The nearer Mr. Harriman, as railway magnate, acts the part of an unemotional machine, dispensing special favor to none, the more will he win respect and consideration for himself as man. Mr. Harriman is one of the most plausible of speakers, but his appeal for sympathy was, after all, but a poorly veiled thrust at his strenuous antagonist in the White House.

Increasing Activity in Gold Dredging.

FROM one of the odes of Horace—forbearing to quote the Latin—we translate, "Nothing is too hard for mortals to do." It seemed a forlorn hope to subdue a 'geologic frost', and win the gold locked in an icy grip that had held on for ages. There were despairing ones who cried the thing impossible, but it has been done, and the ease of the solution, as explained by Mr. T. A. Rickard in an article on 'Dredging in the Yukon,' appearing in this issue, reminds one anew that the most troublous problems are generally worked out by taking advantage of natural phenomena. Man must perforce use Nature to overcome Nature.

Dredging of the frozen gravels in Alaska is now an accomplished fact within limits of economical operation. This opens up a vast new field. Exploration of the North may be said to have only fairly begun. The arctic wilderness cannot be investigated in detail far ahead of the slowly advancing outposts of civilization. It offers difficulties of its own which hold back even the most adventurous spirits, as drought and famine held them back for decades from the great American desert. But the conquest of the North is taking place with immense rapidity,

and the extent of auriferous gravel beds offers enormous opportunities for dredging enterprises.

The search for gravel deposits has become perhaps the most notable feature of recent activity in the mining world. A stream of engineers has been pouring into Colombia during the last twelve months investigating the riches of the Cauca valley. Mr. F. Lynwood Garrison, in a letter from Antioquia, appearing in our special correspondence this week, points out the highway leading to this important goldfield, which he will later describe for us as a result of his investigations. The quest is active throughout South America. Parties are in the field re-examining the deposits in eastern Peru, and others in northern Argentina. Mr. F. J. H. Merrill describes in another column a group of interesting placers in northern Sonora. Though he calls them 'dry placers,' the term is only relative. Water is available in most cases at no great distance, and if the problem of clarifying enough water from the pool to admit of efficient operation of the gold-saving devices be solved, there is no good reason why ordinary dredging should not be extended to such fields also. The experience at Oroville has shown that it requires but a small percentage of argillaceous matter in gravel to hold water in a pool. A dredge has climbed out of the Feather river through the old tailing of the hydraulic mines to a height of thirty feet without difficulty. The limiting conditions for successful dredging are constantly becoming less in the face of conquering human ingenuity.

Protection of Mine Investors.

THE Mining and Metallurgical Society of America announces that the subject for discussion at the September meeting will be the protection of mine investors. This is placing the emphasis where it will lead to a clearer conception of the responsibility of the engineer. It tends to a distinction between engineer and client, between technologist and layman. It recognizes that the investor is a layman, and consideration of the engineer as his counsellor follows in natural sequence. The existence of mining engineering as a profession rests in drawing such a distinction, and in the creation of restrictions founded upon a conception of a body of trained men on the one side, and of a public requiring its services on the other. The laws relating to architects may perhaps be taken as a starting point, indicative of practical methods for reaching a solution of the problem. The line of demarcation between the trained architect and the man who has grown up in the business as a builder and contractor, has been hazily drawn, just as the line separating the mining engineer from the practitioner who has gained his knowledge solely in the field, remains indistinct. The matter is settled in the case of architects by examination before duly constituted commissions. An examination may not necessarily determine ability, but it is the only practicable way of winnowing the wheat from the chaff. But when this is done, it will be found impracticable to shut out unlicensed practitioners from doing actual engineering, just as the State laws are forced to recognize the right of builders to design and erect structures. But the building trade does not come into touch with the stock market, while mining operations do. Therein seems to lie an opportunity for restrictive measures which will at once differentiate the profession as a recognized body of technical advisors, from the investing public. The endorsement of a licensed engineer upon a mining project constituting the basis of a stock company, as a prerequisite for the issuance of stock, would produce a destructive drought, drying up the streams that now turn the mills of unscrupulous promoters. This would tend to bring both mining corporations and mining engineers to a sounder basis of business procedure. The local engineer needs to become recognized as useful and available, in the same way as a local civil engineer, architect, or physician is recognized and consulted. The mining engineer of the future must necessarily be less of a nomad than formerly. Thus will he gain both in influence and in the substantial development of a dependable practice. His has too long been the romantic profession. It will benefit by sacrifice of the glamor.

Ethics of Technical Writing.

IN the beginning let us establish clearly that ethics is a broad term, generously inclusive of those things necessary to be done for the welfare of society. Ethics in its far Grecian origin meant 'character,' the thing that was wholesome and virile and fruitful of good to the race. It consequently includes all that is morally right, and much more that is merely right because expedient. Thus it expresses the duty of responsibility to society, and shifts as the needs of advancing civilization shift. Two of our correspondents have raised questions of ethical relationships between the technical writer and the world he addresses, which are worthy of closer investigation. Technical writing is writing about the way to do things, about the practical art which promotes human welfare, in both a static and dynamic sense. It is part of the eternal obligation of mankind to assume the function of teacher. The man who does not provide his children an education is compelled by law to let the State educate them. He may not set back the race by bringing up illiterates. Whether moral law has anything to say upon this subject or not, society has and always did have a great deal to say upon it, and has been ceremonious in its observance of the rites of education from the days of earliest barbarism. Education has been ever bound up with what man has been pleased to look upon as sacred mysteries. The most practical technical school has never yet succeeded in shaking off this spell and reducing itself to the status of a mere workshop. So he who writes, except the mere purveyor of daily news, is supposed to have a message. If he has not, why should he write? When he takes up his pen he has become the schoolmaster, in which he displays a creditable sentiment, whether or not his contribution advance the cause of education. He has at least shown himself possessed of a more commendable spirit than actuates him who accumulates knowledge and locks it up. In the Middle Ages a man possessed of special scientific

knowledge was in some peril of being deemed a wizard and of having to pay the penalty of death for it. Later the technologist, such as he was, became revered and honored, and he and his coworkers were recognized as possessing 'secrets' too valuable for bestowal upon the world at large. That was the early equivalent of the modern patent. Today the 'secrets' are pretty well out, and young men are instructed in them as principles essential to their equipment for doing the serious work of the age. Moreover the technologist who has not discovered or worked out something which was not understood before, and who has not told his fellows about it, has come to be looked upon in the modern world with suspicion. He is liable to indictment as an ingrate or as an incompetent. Every man must be a schoolmaster. It is part of his sacred duty to the race.

It is evident that the ethics in the case have changed materially within the last six or seven centuries. The duty of a man to set forth what he has learned is a high one. It was for a time recognized as such. But within the last few years an unfortunate reaction has set in, which gives to a discussion of the ethics of technical writing a timely value. On the one hand the cheapness with which periodicals may now be printed, because of improved machinery, wood-pulp paper, and photo-engraving, has called into existence a host of weeklies and monthlies representing not only every art, but even the petty divisions of the arts, until the bewildering multitude is as an ocean, in which if a man throw his his contribution it is liable to be swallowed up and lost. Perhaps worst of all among these 'organs' of special knowledge are many of the publications sustained by departments of universities. Keen editorial selection is not applied in such cases as it is where a paper is compelled to fight for support and win its way by virtue of excellence. The tendency has been to that sort of shallow verbose scientific disquisition which is called sciolistic. There has been a deluge of sciolism. The authority of the printed page has been weakened in consequence. Perhaps this is no evil in itself. Instead of acquiring dignity by the mere fact of being published, as once was the case, a printed statement must now stand chiefly on its own merits. Type no longer gives to a dictum patent royal. Thus sciolism is subject to the laws of Nature, and like every growth secretes its own poison.

Another circumstance tending toward disregard for the obligation to impart the knowledge gained from experience is rooted in one of the most serious defects of the times. The worship of money has always been strong since the day when the devil invented it, but it remained for this mechanical age to erect the pursuit of money into a cult, and to require of every man that he pursue it eternally. It had never before been required of man that he devote his quota of working hours to economic endeavor only, and his spare time to pure play. It had never before been true that if a man chose to relax by doing some useful thing, and to describe the fruits of his work for the benefit of other men, he should be accused of not being busy, and be suspected of the unpardonable sin of financial failure. As there is today much pretense of knowledge, so is there a vast deal of foolish pretense of being busier than the facts justify. This will doubtless work its own cure ultimately, as sciolism is doing. And in the return to reason, each will discover the necessity of being a teacher and of helping forward the world by adding his mite of knowledge, in requital of his advantage in starting with the legacy of the accumulated knowledge of ages past. This is the first duty under that department of ethics which relates to technical writing. After that follow considerations of responsibility as a writer.

Probably no man can write from unmixed motives to do good to others. The doing of good work will benefit him in a material way, and he cannot remain unconscious of the fact. It is a pleasure to one's vanity to have done a thing well, and it is mere hypocrisy to pretend the contrary. A man who takes the attitude of a scientific altruist is either a knave, a prig, or in very truth a hero. For most men a fair sprinkling of self-interest and vanity will not do material harm, if modified by honest scrutiny of the facts presented to the world. This is nothing else than the scientific spirit, which has exalted truth under the influence of the modern inductive method of research. That it should be necessary for 'Escrutador' to challenge the writings of technical men on this account indicates how far the commercialism of the period has been drawing the technologist away from his scientific moorings. In part this is due to disregard for the truth, in part to over-confidence in the scientific value of a great deal of the training given in technical schools, and finally a large cause is to be found in positive ignorance of the principles of evidence. Few men are thoroughly efficient in the examination of scientific evidence. It requires a particularly broad training, and the cultivation of the logical faculty to an extreme degree. It is the same principle that lawyers apply in the court-room, which reveals, in the embarrassments of cross-examination, how seldom any man, with the best intentions in the world, can state "the truth, the whole truth, and nothing but the truth." Yet must we bear witness to the things we have seen and believe. The judge has a penalty for contempt if a witness would refrain; the technologist must produce his testimony from a sense of obligation to his fellow men.

A NOTABLE MEETING of the Canadian Mining Institute is in progress, involving an excursion from ocean to ocean. Delegates from many foreign technical societies are in attendance. In celebration of the event the *Canadian Mining Journal* has prepared a beautiful brochure and map illustrating the mineral resources of the Dominion. With astute suggestion to the future prospector a bold red line is traced across the map, along which runs the legend, "Country north of this line virtually unprospected except along some of the principal rivers." It is surprising to find this line dipping north of Lake Superior to well below latitude 50°, within a degree and a half of the International boundary.

Personal.

C. M. Rolker is in New Zealand.

Frank M. Estes is at El Oro, Mexico.

A. H. Bradford is at Golden, Colorado.

J. F. Kemp, of New York, is in Mexico.

R. H. Campbell is at Teller City, Alaska.

J. M. Evans is at Parral, Chihuahua, Mexico.

John G. Morgan was at Nome on August 25.

Walter Harvey Weed, of New York, is in Arizona.

Whitman Symmes has gone to Mokelumne Hill, California.

Robert T. Hill is making a tour of the Western mining districts.

Horace J. Stevens, of Houghton, Michigan, was in Butte last week.

Frank G. Manley, of Hot Springs, Alaska, is on his way to Boston.

A. E. Druckee is installing a cyanide plant at Kuk San Dong, Korea.

J. H. Hamil is operating on Esther creek, in the Fairbanks district.

C. M. Hamshaw is returning to New York from the Rampart district, Alaska.

Mark B. Kerr is inspecting properties at Grass Valley for San Francisco clients.

H. Foster Bain has returned to Urbana, Illinois, after a trip to the Pacific Coast.

Francis A. Thomson has recently been in Nevada, and now is in British Columbia.

William C. Madge will be at Britannia Beach, British Columbia, for several months.

James P. Kimball is in central Idaho, inspecting dredging ground for Eastern clients.

M. W. Loveridge, of San Francisco, is making a ditch survey in the Hot Springs district of Alaska.

A. V. Thorns is superintendent for Frank G. Manley at Glenn, in the Hot Springs district, Alaska.

Mark R. Lamb is at the Rio Plata mine, Chihuahua, where a new cyanide plant is being installed.

J. P. Rowe, geologist at the University of Montana, is making a study of the Coeur d'Alene district.

W. D. Pearce, of Chihuahua, is now in Nevada making examination of mining properties for Eastern clients.

Edgar B. Van Osdel has been appointed professor of chemistry at McMinnville College, McMinnville, Oregon.

E. H. MacDonald, of Butte, Montana, was engaged in geological work in the region of Lake Pend d'Oreille, Idaho, last week.

A. H. Brooks, chief of the Alaska division of the U. S. Geological Survey, is making his annual tour and is now at Fairbanks.

Harry C. Klause and Harry L. Wollenberg, of Berkeley, California, are in Sonora, in charge of explorations for a California syndicate.

C. C. Titus, formerly with the A. S. & R. Co., at East Helena, Montana, is manager for the Idaho Smelting & Refining Co., at Ponderey, Idaho.

Lee Fraser, of Saginaw, Michigan, has accepted a position as engineer for the Aguacate Mines, Inc., at San Mateo, Costa Rica, Central America.

Arnold S. Langley, assayer at the smelter of the Britannia Copper Syndicate, Ltd., at Crofton, has been transferred to the mine at Britannia Beach, British Columbia.

Arthur C. Terrill, for the past two years professor of mining and metallurgy at the University of Oregon, has been appointed professor of metallurgy at the University of Idaho.

Latest Market Reports.

LOCAL METAL PRICES—September 10.

Antimony	12@16c	Quicksilver (flask)	$40@42.50
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.95@ 5.90c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept. 3. £. s. d.	Sept. 10. £. s. d.
Camp Bird	0 13 6	0 13 9
El Oro	1 7 0	1 6 6
Esperanza	3 3 9	3 3 6
Dolores	1 10 0	1 10 0
Oroville Dredging	0 10 0	0 11 0
Stratton's Independence	0 1 0	0 1 0
Tomboy	1 2 3	1 3 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Sept. 4	13.50	4.58	4.71	51¼
" 5	13.50	4.58	4.71	51⅝
" 6	Sunday.	No market.		
" 7	Holiday.	No market.		
" 8	13.50	4.58	4.74	51⅞
" 9	13.50	4.58	4.76	51½
" 10	13.50	4.58	4.76	51⅝

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Sept. 3.	Sept. 10.
Amalgamated Copper	77⅝	77½
American Smelting & Refining Co.	92¼	93⅝
Boston Copper	12	12½
Butte Coalition	26	
Cumberland Ely	8¼	8
Dolores	6¾	6½
El Rayo	2¾	3¼
Giroux	4¼	4
Greene-Cananea	11	11⅛
Indiana Sonora	5⅛	5⅛
La Rose	5⅞	6¼
Miami Copper	11¾	11
Nevada Consolidated	16	16¼
Newhouse	6¼	5¾
Nipissing	8¼	8⅝
Ohio Copper	3	3
Tennessee Copper	38¼	38½
Utah Copper	44½	44⅝
Yukon	4⅜	5⅛

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 10.

Atlanta	$ 28	Laguna	$ 1.20
Belmont	1.07½	Manhattan Con	8
Booth	45	MacNamara	53
Columbia Mtn	27	Midway	31
Combination Fraction	1.42½	Montana Tonopah	1.35
Daisy	70	Nevada Hills	1.30
Fairview Eagle	35	Rawhide Queen	72
Florence	3.92½	Sandstorm	23
Gold Bar (Bullfrog)	4	Silver Pick	20
Goldfield Con	6.30	St. Ives	30
Gold Kewanas	38	Tonopah Extension	70
Great Bend	35	Tonopah of Nevada	7.20
Jim Butler	27	Tramp Con	16
Jumbo Extension	41	West End	59

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

Wires out of order on September 10.

	Closing prices. September 9.		Closing prices. September 9.
Adventure	8¼	Mohawk	66
Ahmeek	98	Nevada Con	16
Allouez	36	North Butte	84¾
Amalgamated	79⅜	Old Dominion	42¾
Arcadian	4	Osceola	110½
Atlantic	16¼	Parrot	28¼
Bingham Con	50	Phœnix	50
Boston Con	12½	Quincy	93
Butte Coalition	26¼	Rhode Island	4¼
Calumet & Arizona	119½	Santa Fe	2
Calumet & Hecla	665	Shannon	15¼
Centennial	32	Superior & Pittsburg	14½
Copper Range	78¼	Tamarack	74
Daly-West	9	Trinity	19⅞
Franklin	13½	United Copper Con	11
Granby	101	Utah Copper	46¼
Greene-Cananea, ctf	11	Victoria	5
Isle Royale	23¼	Winona	6
Mass	6½	Wolverine	145

General Mining News.

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—A strike of rich ore is reported to have been made at the property of the Bisbee-Sonora Development Co., 30 miles northwest of Tombstone. The discovery is an outcropping vein near the office of the Company, and the miners have been walking over it for the past year. Two miners are at work breaking ore for shipment, and more will be started soon.——Ore carrying free gold has recently been found by W. H. Smith on his claim at Paradise, near the Willie Rose. The property is not a new one, but was worked 30 or 35 years ago, and the recent strike was made in an old incline shaft.——The adit at the Virtue mine, at Portal, is in 325 ft., and it is the expectation of the management that the vein will be struck within the next 25 ft. The work on the group of claims owned by John A. Duncan, near Paradise, is being centred on the Sunflower and Comanche Chief claims. A quantity of track was recently moved from the Mayflower to the Sunflower adit. J. G. Sweeny has sold his lease on the Columbia to Bernoudy & Wright, who, it is stated, will commence shipments at once.

Paradise, September 5.

GILA COUNTY.

The shaft of the recently re-opened Stonewall mine, at McMillen, has reached a depth of 150 ft., and a cross-cut started at the 90-ft. level has been driven 65 ft. to a connection with the old workings. The shaft will be sunk to the 300-ft. level before any exploring is started. V. Y. Smith is the superintendent.

MARICOPA COUNTY.

The famous Vulture mine, near Wickenburg, has been sold to Philadelphia and Baltimore capitalists for $500,000. The new owners are expected in Wickenburg at an early date, and it is believed they will at once resume operations. D. J. Curry, of Wickenburg, represented the former owners.

MOHAVE COUNTY.

A new strike has been made at the 600-ft. level of the McCracken mine. Four and a half feet of ore was uncovered in a cross-cut, which samples $103 per ton. Small streaks of the vein assay several thousand dollars per ton. The mine is 75 miles southwest of Kingman.——The Tom Reed Co. recently made a clean-up after a 15-day run at its 10-stamp mill, near Kingman, the bullion amounting to nearly $40,000.——J. W. Thorn, of Cerbat, is preparing to resume work on his Horseshoe mine, near that place, and will sink his shaft 100 ft. deeper.

YAVAPAI COUNTY.

The management of the Monica mine, 13 miles north of Kirkland, is planning a 40-stamp mill to take the place of the existing 20-stamp mill. Sixty-five men are employed in the mine, and the mill is treating 60 tons per day. The process is crushing in cyanide solution and subsequent cyanidation.——The Big Stick Co. is at present working 22 men in the mine. A 20-stamp mill is being erected and the management expects to have the plant in operation by the first of the year. The ore of the Big Stick averages between $7 and $12 per ton gold and comes from a vein which is five to seven feet wide.

CALIFORNIA.

NEVADA COUNTY.

(Special Correspondence).—James Williams and associates have located three claims above Bowman's Dam, and expect to work their holdings on a large scale during the fall.——H. G. A. Brunnier has announced that funds will be forthcoming for the liquidation of the indebtedness of the Conlan G. M. Co., and that work will soon be resumed at the mine.——The station for the electric pump at the 1300-ft. point in the Prescott Hill shaft of the Sultana mines has been completed and the machinery will be immediately put in. The pump has a capacity of 600 gal. per minute.——Operations have been discontinued at the Dolly Madison and the machinery is being hauled away.——The Lecompton mine has been unwatered to the sump below the 500-ft. level, and active work will soon commence. A large compressor has been ordered for the property.——The Eastern company operating the Norambagua has placed an order for a large compressor.——The Liberty and Maggie claims have been purchased by A. Becker, and a force of men put to work.——Joseph Weisbein and Mark B. Kerr, of San Francisco, are inspecting the Gold Flat, Federal Loan, and other properties in the Nevada City district. Work will be resumed at the Gold Flat in the near future, according to the present plans of Mr. Weisbein, the principal owner.——The working force at the Idaho-Maryland is being steadily increased. The work of re-timbering the shaft is proceeding steadily.

Grass Valley, September 7.

SAN BERNARDINO COUNTY.

Gold Valley is the name of a new mining camp in the Gold Belt mining district, about 28 miles southwest of Hart and 14 miles southeast of Cima, on the east slope of the Providence range. Last winter a number of Hart people made several locations in that vicinity, and everyone who has visited the district declares that the showing there is good. Quite a rush is now on at the new gold camp, and it is said everything for miles around has been located. A townsite has been laid out and over 50 tents have been put up. At a depth of 100 ft. Warfield & Neumayer have opened a 16-in. streak of free-milling ore which gave $130 returns on two tons of ore worked through an arastra. A two-stamp Nissen mill has been ordered.

SHASTA COUNTY.

Another contract for 100 ft. of tunneling has been let by the directors of the Grand Central Mining Co., for work on their recently acquired mining property in Harrison gulch. The moving spirits in the enterprise are C. C. Corbiere and his brother, of Redding.——The Bank of Shasta County has commenced foreclosure proceedings against the Phoenix Security Co., involving properties in the Bully Hill district, as well as the Mount Shasta gold mine, near Shasta.——The Dorleska mine, on Union creek at the head of Coffee creek, is at present under lease to M. L. McIlwaine, who has been doing development work.

SIERRA COUNTY.

Fred Searls and D. J. McFall, of Nevada City, have taken a bond on the 16 to 1 lode claim, at Alleghany, and expect to organize a company to develop it.——The Bonanza King mine, near Alleghany, the controlling interest in which is owned by Flynn Bros., has been bonded for three years to a San Francisco company. According to the terms of the bond, work must be started immediately. The consideration is said to be $10,000.——A stamp-mill is to be erected at the Omega placer mine, at Forest. Some of the richer gravel is cemented to such an extent that a mill is necessary to break it up.——Five additional stamps and a tramway will be added to the equipment at the Papoose mine, in Jim Crow canyon. Adam Keiffer, of Downieville, will have charge of the mill.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Work is to be resumed at an early date upon the holdings of the St. Paul M. & M. Co., on Green Lake Mtn. The adit is to be driven steadily forward for the intersecting of the St. Paul vein, which is supposed to lie about 400 ft. distant. The St. Paul is an extension of the Colorado Central, lying to the west. The adit has been advanced for 1400 ft. and previous to the suspension of work last fall a promising vein had been intersected. Mont Tong, of Georgetown, is manager.——Work on the Montgomery-Ward adit is progressing in a satisfactory manner. Since the hanging wall of the Pay Rock Extension vein was reached, driving has been under way and there is showing in the heading a streak of high-grade silver-lead ore that is from 4 to 6 in. wide, and

assays from $45 to $60 per ton. J. J. White is manager. ——Shipments are being maintained from the Lebanon property, the ore being of a high grade, the average value of the product exceeding $90 per ton in silver and lead. The task of advancing the adit, now in 1000 ft., for the intersecting of the Elijah Hice vein, will be under way in the course of a couple of weeks. A company with strong financial backing is in process of organization, and as soon as plans are formulated a consolidation of the Everett and Lebanon holdings will be perfected. W. H. Maxton is in charge of development.——The Seven-Thirty M. &. M. Co. has just been organized, with W. A. Hood, of Silver Plume, serving as managing director. This Company will complete the work of putting through the raise to drain the Seven-Thirty shaft. Work is to be resumed in a few days. The Pelican mill, with a daily capacity of 250 tons, has also been secured and the machinery is running day and night. People of the district interested in mining are anxiously awaiting the draining of the Seven-Thirty mine workings, as a large block of virgin territory will be opened for exploration. A number of lessees have already made application for privileges, many of which will be granted as soon as the preliminary work has been completed.——Skews & Clair, leasing on the third level of the Smuggler, have shot into a streak of ore that is 18 in. wide. A shipment was sent out last week and settlement was made at the rate of 137 oz. silver and 20% lead. The ore was found 140 ft. from the shaft. On the fourth level Franchini & Co. are stoping on a 12-in. streak of medium-grade ore that mills an average of $30 per ton in silver and lead. Announcement has been made that on October 1 work will be put under way in the sinking of the shaft another 100 ft. This work will prove of great importance, as the ore-shoots of Brown Mtn. are known to extend to a great depth, as has been ascertained from development of the Terrible mine. The Terrible vein runs parallel with the Smuggler, lying only a short distance away.——Work has again been resumed upon the Tom Payne property, on Democrat Mtn. These holdings have recently been purchased by E. K. Cass and a company is now in the course of organization. The adit is in 600 ft., and from surveys the heading should cut under the shaft workings within 15 ft. Ore of a high grade was mined from the original workings.——E. E. Grubb is developing the Teddy group of claims on Columbia Mtn. The adit is being driven ahead at the rate of 2 ft. per day, while a streak of mineralized quartz is exposed that is 10 in. wide.——James Oldfield, owning a group of 17 claims and a tunnel-site on Red Mtn., in the Daily district, has started work and promises to continue development through the winter months. Mr. Oldfield has interested a number of capitalists who reside in Tennessee.——The Butler property is making a good showing, and occasional shipments of ore are being sent out. No effort is to be made for a heavy production, pending the completion of the 50-ton concentrating mill which is in course of construction. E. M. Moscript, of Idaho Springs, is manager.

Georgetown, September 5.

GILPIN COUNTY.

A carload of machinery, comprising a compressor and complete equipment of drills, was recently received at Black Hawk for the Buckley mine, in the Eureka district. W. Morphy and associates have recently purchased the property and will begin work at once.——Colorado and Eastern people have become interested in a lease and bond on the Gladstone and Firenzi claims, in the Illinois-Central district, owned by John Brohl of Central City. The main work is to be done on the Gladstone shaft, which is down a depth of 220 ft., and which is equipped with a good plant of machinery and a shaft building. The lessees have already started to unwater the shaft, and as soon as possible will commence the work of sinking it at least 100 ft. L. D. Whitney has been placed in charge of operations and the working force will be increased as soon as possible.——The Lone Star group of 12 claims and a tunnel site on the south side of South Boulder creek, in the Wisconsin district, has been purchased by James A. McCracken, of Tolland, from the estate of the late Milo T. Straight, of Denver. The new owner will begin work at once, and expects to continue all winter.——Denver people are unwatering the winze below the adit of the Copper Jim property, in Wisconsin district, for the purpose of examination. The winze is 40 ft. deep and some high-grade silver and copper ores have been taken out from a fair-sized streak.

LAKE COUNTY.

The old Forepaugh shaft, at Leadville, is being worked through the Sliver. A number of Finnish miners have secured a lease on it and are producing a regular tonnage of good ore. The shaft-house on the Forepaugh, which was destroyed by fire last fall, has not been re-built, but there is a possibility that it will be before long.——A new engine and hoist are being put in at the No. 7 shaft of the Matchless, preparatory to exploring the large orebody in which such high-grade silver discoveries were made when Senator Tabor owned the mine. Shipments are being made regularly from the No. 5 shaft to the Arkansas Valley smelter.——Charles Aichers, who has been working on the Eclipse property, on Breece hill, during the past few months, has closed up his work there and is now transferring his plant of machinery to the Maume claim, in South Mosquito. As soon as the machinery is placed he will start sinking.

TELLER COUNTY.

The Strong Gold Mining Co. is to start within a short time the erection of a new orehouse at its property on Battle Mtn., near Cripple Creek.——McCafferty & West, of Pueblo, who have a lease on a group of claims on the northeast slope of Tenderfoot hill, expect to start a shaft for exploring several veins which outcrop. The lease is a favorable one, being graded royalties.——Morris Bros., who are operating on the Morning Star, on Bull hill, are installing a hoist to take the place of the windlass now in use. Notwithstanding the poor equipment in use in the past, shipments have been made at the rate of three cars per week, from which returns as high as $200 per ton have been received.——It is reported that the Wishbone mill, on the extreme northern slope of Tenderfoot hill, will be entirely overhauled and roasters added. It is probable that a spur from the Colorado Springs, Cripple Creek District railway will also be built. It is the intention of the owners, who are St. Louis capitalists, to treat custom ores, as the ore in the company mine did not prove payable.——Charles Harrison has secured a lease on the Half Moon, of the Matoa Gold Mining Co., a Stratton Estate corporation, and will soon place the property on the shipping list.——The Blue Flag mill, on the east slope of Raven hill, resumed operations last week, after a close-down of some time. The plant has been thoroughly overhauled and repaired, and is now in good shape to handle the output of the mine. No attempt is being made to operate the plant at its full capacity, and only a portion of the full force was put to work. The mill is treating ore from the mine, having an average value of about $4 per ton.——The entire plant of the British American Mining Co., Ltd., at its property near Victor, was destroyed by fire in the night of August 31. The majority of the loss is covered by insurance. The shaft itself was not injured, although the shafthouse was destroyed. The fire is believed to have been of incendiary origin.——William Matney has secured a lease on the Maggie No. 2, at Cripple Creek, and will start active operations immediately. The lease runs for a term of 18 months, with graded royalties. The Maggie adjoins the Pointer property on the south, on which a good strike was reported to have been made.

IDAHO.

OWYHEE COUNTY.

A larger air-compressor has been ordered for the Potosi, which will be of sufficient power to run 12 or 14 drills, and with the one now in use will enable the work in the mine to be pushed much more rapidly than at present.

IDAHO COUNTY.

It is announced that the Graham-Ross Co., recently reorganized by the bondholders, will begin work on the Ana-

conda property, in the Newsome district, by September 15. Work is also to be started on the Georgia mining property, adjoining the Anaconda and owned by Smith Bros.——P. P. Jennings of Portland, who holds a bond for Chicago men on the Gold Seal placer grounds, has started a crew of 12 men at prospecting, with a view to putting on a dredge. A steam pump is being used, and three holes have been sunk to bedrock.——Schuyler Simmons has struck a vein of ore five feet wide at the Hope mining property, two miles east of Elk City. The property is under bond to capitalists of Philadelphia, and Atlantic City, N. J., and the discovery was made while digging a 10-ft. hole in making an amended location.——The Elk City M. & M. Co., operating two properties in the Elk City district, has awarded to Svenson & Tideman two contracts, one to sink 50 ft. on the Gold Bullion claim and run a drift into the hill, and another to extend the main adit on the Columbia and run cross-cuts therefrom. It is understood that work on both contracts is to be commenced at once. The Gold Bullion is a Spokane corporation, and J. MacFachran and John W. Rummage are largely interested.——J. H. Farniss, of Philadelphia, has taken a four years' bond for $25,000 on the Royal Blue group of three claims in the Rapid River district. Little development work has been done, but prospecting shafts sunk along the vein indicate high-grade copper. The property is owned by a partnership of prospectors.——The new five-stamp mill at the South Fork (Espey) mine, which had been in course of erection for several weeks, is completed, and milling was started last week. Frank Peck, who is manager, is employing 12 men.

SHOSHONE COUNTY.

(Special Correspondence).—It is reported that the Federal M. & S. Co. is about to abandon the Tiger-Poorman mine at Burke. This report has been in circulation for some time and appears to be well founded in fact. Work has already begun at the Standard mine, at Mace, cutting a station for the great pumps of the Tiger-Poorman, which will be moved to that property. Meanwhile a clean-up is being made in the mine, and as soon as it is completed and the machinery removed, one of the greatest mines in the district will pass into history. In the height of its glory, the Tiger mine worked all the way from 300 to 600 men, but for a long time past only 60 have been employed. Recently some ore was struck in the property, but it is stated that it is not in sufficient quantities to warrant the expense of working. Last year the output of the mine was in the neighborhood of $250,000 gross, and the Company reported a loss of over $100,000 in its operation. For more than 16 years the property has been steadily producing and is credited with having disbursed millions of dollars in dividends.——Assays on 42½ lb. of ore taken from the Pilot mine, at Murray, have given the enormous returns of 856.88 oz. gold and 1004.35 oz. silver per ton, making a total value in cash of $17,639 per ton. The mine is owned by John Docktor and Frank Frohling, of Murray, and Louis Prager, of Spokane.——The Surprise mine, on Pine creek, has resumed with a full force of men. Last year a 125-ton mill was erected at the property, but shipments were soon discontinued, owing to the depression in the metal market. A car of concentrate will be shipped from the mine at once and other shipments will follow in regular course as soon as the Company gets into full swing. A new orebody was recently opened up in this mine and it is the general impression that it will join the dividend list in the near future.——A strike of 2½ ft. of gray copper ore has been made in the property of the Mineral Point Mining Co., about three quarters of a mile south of Osburn. This ore shows an average of about 16% copper and carries silver all the way from 400 to 600 oz. per ton. The strike was made in the upper workings of the mine and near the old ore-shoot from which about $20,000 worth of the same class of ore was shipped some time ago. The find is about 90 ft. from the surface and at a distance of about 150 ft. from the portal of the adit. It is planned to commence shipments at once.——More than $12,000 is to be expended in equipment on the property of the Liston Mining Co. This will be applied toward the installation of a new boiler, the construction of a 4500-ft. flume, from the mine to the south fork of Big creek, and the erection of a saw-mill. Ten men are engaged on the property at present and all are being occupied with driving on the vein.——The Clearwater Gold Mining Co. is expending between $5000 and $10,000 in the installation of hydraulic power. The Company's claims are in the St. Joe country and take in over two miles of the creek bed.——The long flume from Moon gulch to the property of the Wisconsin company has been completed and the machinery for the compressor ordered. This mine has been under development for many years and several shipments have been made. The development will now be rushed through with a full equipment and it is expected that shipments will soon be resumed.——Six feet of lead-silver ore has been opened up in the Iron Mask, in the Carter district. The ore was found at a distance of about 900 ft. from the portal of the adit and at a depth of about 500 ft.——The long adit of the Copper King Mining Co. is now assured. Of the first assessment for $15,000 levied some time ago, over $13,000 has already been collected. The compressor and other machinery are on the road and expected to arrive daily. All the buildings and the bunk-house have been completed, and the flume is ready to connect up. Two assessments for $15,000 each will be made later.

Wallace, September 5.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The ore prices for the week were a little higher than usual. The Blackberry mine, at Joplin, sold its ore for $39.50 per ton. Silicate advanced from $18 to $22 per ton and lead is normal at $61. The largest producer in the district was the Underwriter's Land Co., at Webb City, with 550,000 lb. zinc and 193,630 lb lead. Second was the American Z., L. & S. Co., with 486,920 lb. zinc and 170,680 lb. lead, while the third was the Kansas City-Bradford, with 482,020 lb. zinc and 19,970 lb. lead. The total value of the output for the entire district was $253,855.——Perhaps no camp in the district is more active at present than the Spring City field, south of Joplin. Two new shafts are being sunk at the Alladin mine upon good drill prospects. Both galena and zinc-blende are found here, the galena being in large quantities and very pure. The 100-ton mill began to operate double shift last week. The Plata Mining Co. has begun the development of a ten-acre tract on the McCowan land.——New machinery has been added to the Argosy plant, at Spring City, and the mill has been overhauled, increasing the capacity of the plant.——The new Delta mill is one of the few in the district without a tailing elevator. This is unnecessary because the mill is situated high on a hill and the tailing is carried down the hill-side direct from the jigs. The shaft of the Delta is down 165 ft., though the other shafts in the camp penetrate the same orebody at 100 ft., the variation in the depth of the shaft being due to the elevation of the mill. About 40 tons per week are being produced at this mine.——The Alpha mine, one of the steady producers of the district and an old property, has resumed operation, having been closed down many months owing to the high waters of last spring and the low ore prices of the summer. The ground has been well worked, but there remains much uncut territory. A 150-ton mill is on the lease. Drilling operations in a new portion of the lease have been completed recently and a new shaft connected with the mill by a tramway.——Two of the oldest mines in the district are being opened. The Beeville mine, south of Carthage, is being operated by C. F. McElroy, who is taking out a large quantity of lead carbonate. Over 36,000 lb. have been taken out in the past three weeks.——The Mosley mine, south of Joplin, is being pumped preparatory to re-opening. The ore is found at 118 ft. This mine was operated by the Confederates during the war, when the lead was used for bullets. A lead smelter is known to have been operated on that land many years before the war.——Preparations are being made by a number of companies to erect milling plants this fall on their leases.

A large plant will be erected by Budd Robinson, on the Claycomb land west of Chitwood, where a good mine is being developed. A number of drill-holes blocked out the ore deposit and a shaft has been sunk. A 35-ft. face of ore was penetrated extending to 185 ft. Five hundred feet of drifts have been run and 200 tons of ore have been piled on top.—A 200-ton mill on the Criterion lease, at Prosperity, is planned. The last year has been given over to development of the ground. Two shafts are in ore at 200 ft. and three working drifts have been opened up. The ore is sheet-ground and carries a good percentage of galena.—— The Sunset mine, south of Duenweg, will have a new mill. The shaft is down 132 ft., from which point a drift is being run. ——Robinson & Co. have completed a 150-ton plant south of Sucker Flats, near Webb City, the plant operating on a continuation of the orebody found in Sucker Flats. This land is in a badly-cut condition though there is much mineralized territory still.——There will be four new mills on the 40-acre tract of the Cosgrove land, at Duenweg, one 200-ton plant having just been completed and the others planned for the immediate future. A 10-acre sublease has been taken by the United States Co. and Brubaker Bros. have taken the remaining 30 acres. Several drill-holes were sunk on the land, not one proving a blank. The orebody occurs at 197 to 256 ft.——A new plant of 200 tons capacity has been recently completed by A. L. Shepard, of Chicago, on the Center Creek Mining Co.'s land. Development work is carried on below the 100-ft. level. The adjoining 10-acre plot has been leased by Mr. Shepard, and the old Beasley mill has been overhauled and greatly enlarged. The ore is developed from 125 to 130 ft. and is a continuation of the famous Kansas City-Bradford mine in the same vicinity.——Among the rich strikes recently reported in the district is the find in the Try More mine, at Leadville Hollow, near Joplin. The deposit was found above 100 ft. and is rich in galena and zinc-blende. This strike has greatly stimulated prospect work in the vicinity, drill-holes being sunk on both the Leonard and Granby lands adjoining. The Leonard shaft has almost reached the ore, while the shaft on the Granby struck a limestone bar and was abandoned. A second has been started.——One of the best recent strikes was made in the Lucky May, southwest of Joplin. Ore was found at 107 ft., and the drill-record shows 60 ft. of good ore. Drifts in several directions show a 35-ft. face of ore. A 150-ton mill has been contracted for. The mine is in the same vicinity as the Morning Hour, Big Three, and Pumpkin Head, all famous producers, and the new property bids fair to rival these.——Moonshine Hill, east of Joplin, is to be developed by B. F. Wurzel and associates. The water has proved to be serious since the shutting down of the Missouri L. & Z. Co.'s pumps. A drift is being driven at present to connect the two shafts, 240 ft. apart, and though the work was done for the purpose of connecting only, a good strike of ore was made.——While sinking a deep well in Alba, for the city water supply, an ore strike was made at 210 ft. The ore is rich zinc-blende. A careful record of the strata will be kept, which will prove valuable to the prospector and geologist, as the well will probably be sunk to 1000 ft. and will be the deepest well in the northern part of the district.

Joplin, September 5.

MONTANA.

JEFFERSON COUNTY.

(Special Correspondence).—The Boston & Corbin mine was acquired by a Boston company, headed by M. L. Amster, in February, 1907, since which time the property has been developed under the management of H. E. Emerson, formerly on the staff of the Amalgamated at Butte. Locally it is known as the Bertha mine, and is situated a mile from Corbin station. There are three veins, carrying copper and silver, which have a northeast strike through a granite country. The three are within a zone 250 ft. wide. The principal development is on one of the veins, consisting of two adits, 1500 and 1000 ft. long, respectively, the latter being 375 ft. below the former. A 300-ft. shaft has been sunk from the lower adit, giving a depth of 675 ft. on the vein. One of the other veins has been opened by a cross-cut from the shaft. Total development aggregates 5000 ft., of which 2500 ft. has been accomplished within the last year. The ore is said to average 4% copper and 6 oz. silver. It is stated that a concentrating plant will be erected next spring.——The Black Jack mine, in the same district, is being developed by a small force. It belongs to Couch & Dunn, of Great Falls.——The old Alta mine, a former producer of silver and lead, which has been idle for 12 years, is reported sold to parties who will start it again. The Alta veins, also in the granite, strike at right angles to the Boston-Corbin veins. The Alta was well developed and well equipped with mining and milling machinery.—— The Ballard mine, belonging to Ballard Bros., of Jefferson, is situated at the head of Prickly Pear valley, near Mt. Baldy. A vein of free-milling gold ore has been opened, some of the high-grade of which has been hauled to the railroad and shipped, the returns amounting to about $50,000. A mill will be built.

Corbin, September 2.

NEVADA.

ESMERALDA COUNTY.

Rawhide was almost completely destroyed by fire, which started on the morning of September 4. The cause of the fire was the explosion of a gasoline stove in the basement of a drug store. The fight to save the town was greatly handicapped by want of adequate water supply. The business part of the camp is completely wiped out, but no injury was done to the hoisting plants of the mines. Trainloads of supplies were rushed in from Reno, Tonopah, Goldfield,

Hooligan Hill, Rawhide.

and surrounding camps, and none suffered from hunger or exposure. The work of re-building has started and the miners are all at work.——William C. Rose has leased and bonded the seven claims constituting the Zion group, belonging to the Zion Con. Mining Co., lying three-fourths of a mile northwest of the Great Bend, in the Diamondfield district, and has also leased and bonded the Jefferson mining claim, on Masonic Mtn., 12 miles north of Bodie, Mono county, California. The leases and bonds have 18 months to run, and it is the intention of the lessees to begin active operation upon the properties at once.——The shaft on the Fairview-Cherokee lease on the Atlanta is to be sunk 200 ft. from its present depth of 545 ft. Heavier machinery will also be put in.——A movement is on foot to construct a street railway at Goldfield, the line to have Diamondfield as one of the termini. The route partly determined upon is by way of the Consolidated mill, Columbia, and the principal mines of the district, also traversing the business and residence sections of the city. T. F. Manning, George Wingfield, and L. T. Merwin will make application for a franchise at the next meeting of the board of county commissioners. The proposed company has already been financed to the extent of $125,000.——The mines of Goldfield produced during the week ending September 5 a total of 2705 tons, estimated to be worth $177,280. During the same period the Tonopah mines produced 6570 tons, of an estimated value of $175,800.

HUMBOLDT COUNTY.

The 10-stamp mill of the Seven Troughs Kindergarten Mining Co. treated 183 tons of ore during August, and produced a bar of bullion weighing 1216 oz. and valued at

$14,592. The Company has ordered a 25-hp. gasoline hoist, and will begin the sinking of a new shaft at an early date. ——It is reported that Martin Oleson is to start a traction engine and wagons running on the road between Lovelock and Seven Troughs.——It is reported that Al D. Myers, who recently sold out all his interests in Goldfield, has bought into the Hemminger group of eight claims at the head of Wild Horse canyon, in the Seven Troughs district.

LYON COUNTY.

After being idle for nearly four years the 5-stamp mill at Nordyke is being overhauled and put in condition and will be started up next week. The first run will be 100 tons of ore from the property of the Wilson Mines Co. at Mountain View.

NYE COUNTY.

The Goldfield Blue Bell Mining Co. has recently acquired the Stokes property, at Berlin, consisting of 25 patented claims, including the Berlin, Shamrock, Downeyville, and Richmond groups. The Berlin mine is well equipped with a hoist, machine shop, compressor, lighting plant, and a 30-stamp mill. S. T. Pearson, who is manager, is putting the plant in shape and will start work this week.——Thomas Blair, who is superintendent of the Aurora, at Springdale, has gone to Milwaukee to purchase a hoist, and possibly a reduction plant, for immediate use on that property.——The Wild Bill Mining Co., at Manhattan, has purchased a five-stamp mill and it will be put into place at once on the Company's ground in the northern mineral belt.——The Mayflower, at Rhyolite, will resume operations at once, and will probably build a small mill for experimental purposes. Sidney Additon has recently succeeded Robert Smith as superintendent.

OKLAHOMA.

OTTAWA COUNTY.

(Special Correspondence).—All northeastern Oklahoma is being prospected for ore and indications are favorable for a splendid continuation of the Joplin field into the new State. Several leases near Narcissa have yielded good strikes of zinc-blende. On the farm of W. H. Sutton, at Grove, both galena and zinc-blende have been found. In the Spavinaw hills, 40 miles south of Miami, a company of Muskogee men have begun operations and are finding good ore. Other points in this State report good strikes. ——Pipes are being laid from Miama to the mining camp to supply the mines with oil which will be used exclusively as fuel. Although oil has been used in emergencies in other parts of the district, this is the first time that an attempt will be made to make it the principal fuel.——A shaft is being sunk at the Miami-Yankee mine southwest of the present shaft. This will not only further develop the orebody, but provide ventilation, which is badly needed. A reduction of the royalty on the lease has been procured, and every effort is being made to hasten the development of the mine.——The Kenwood mill on the Index lease is now completed and thoroughly equipped with a view to the most successful handling of the peculiar ore formation in this camp. It will soon enter the producing list.——The King Jack, another new mill, began operation this week, and, while not running steadily, made a good record. Last week four tons of zinc-blende and three tons of galena were shipped.

Miami, September 8.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The wagon road for hauling ore from the Manilla mine to the Keller & Indiana Con. smelter is nearly completed. Upon completion of the road the Company will immediately employ a large force in two shifts, blocking out and breaking down ore. A contract for hauling the ore has been let to Martin & White, of Republic, who have purchased eight large ore-wagons and 32 head of horses and expect to haul from 30 to 40 tons per day. The Company expects to have 1000 tons of ore on hand and to blow in the smelter about October 1.

Republic, September 4.

STEVENS COUNTY.

(Special Correspondence).—A gasoline engine, blower, and additional pipe have been delivered at the Trojan mine, and fresh supplies have been sent in for the immediate resumption of operations.——At the Daisy mine, near Addy, an adit is being pushed rapidly forward. At about 500 ft. from the portal a vein of ore assaying well in gold, silver, and lead has been struck. It is 4 ft. wide.——The Bonanza mine, near Bossberg, which has been under operation from time to time, with varying success and for several months before the last financial panic was operated extensively, is again under development. It is expected to ship about three carloads per week. The Company is reported to have a five-year contract for the disposal of its ore.——The old buildings at the United Copper mine, near Chewelah, have been torn down and a new engine-room and blacksmith shop have been completed. The buildings and mine have been wired and are now lighted with electricity. A new orebody, 5 ft. wide, paralleling the vein which has been long under development, has been struck on the 375-ft. level. The character of the ore is different from that hitherto found in the mine, and it carries about 8% copper, and also assays higher in silver than any ever before found in the mine. The two veins are separated by a few feet of shale. The new discovery has been followed with a drift, in over 60 ft. The ore from it will be shipped separately from the other. The two veins have a total width of from 10 to 12 ft.——The new concentrator of the Spokane Lead Mines Co. ran only ten days after completion before it was closed down. Liens have been filed by 28 workmen, and those, together with the claims of the Union Iron Works of San Francisco and other large creditors, amount to about $30,000. From the mill-run 7800 lb. of galena-concentrate, assaying 70% lead, was cleaned up. Mismanagement is charged. An extraordinary strike of ore was reported to have been made in the Mina claim, owned by the Company, two days before the mill was shut down, which is said to have been unknown to the Company. Stockholders are asking for an explanation.

Metaline, September 2.

MEXICO.

The Teopari mine, three miles northeast of Sahuaripa, Sonora, has been taken over by the Mesa Rica Gold Mining Co., a Milwaukee company organized by J. J. Smith. A. F. Tanner is the manager. The property has a 10-stamp mill and plans to build a tramway and to install the cyanide process. The company's offices are in the Calumet building, Chicago.——The Mineral Development Co., of Guanajuato, is making arrangements for funds to continue work on the Nueva Luz mine, in the La Luz district. The shaft is now down 1200 ft. H. H. Miller is the manager.——The Mexican Standard Mining Co. has been organized at Denver, Colo., to operate the Candelaria mine, at Parral. J. S. Jones is the president and N. H. Partridge the manager. The mine has been owned by these men for some time.—— The Oaxaca Smelting Co. has been reorganized and the early opening of the plant is assured.——It is reported that the El Tigre mine, Sonora, has been bonded to the Phelps-Dodge Co. of New York and Arizona. The price is said to be $8,000,000. A railroad from Nacozari to the mine is contemplated.——The Cherokee Gold Fields Co., at San Julian, Chih., is operating 15 stamps, and with the installation of the Krupp mill will have a capacity of 50 tons daily. Gerald V. Hopkins is the manager.——The Sonora Copper Co., operating at Cobre Grande, Son., via Noria, has developed extensive orebodies and is planning to erect a smelter. A. M. Conard is the manager and Bert Cunningham superintendent. The property has been under development for about a year.

The Natividad Mines & Reduction Co., San Sebastian, Jal., is erecting a 200-ton cyanide plant. The Company is largely owned in Berkeley, Cal.——The San Francisco del Oro mines, an English corporation, will build a railroad from the end of the Company's tramway to the Mexican Central's line between Parral and Santa Barbara.

Special Correspondence.

LONDON.

Operations of Williams, Harvey & Co. in Cornwall. — Secrecy in the Arts. — Rival Flotation Processes. — Conditions at Broken Hill.

In writing of Cornish tin-smelting works recently, I mentioned the fact that the old firm of Williams, Harvey & Co. of Hayle had during recent years come to the front and that it might now be called the leading smelting firm in Cornwall. This progress is due to the management of Mr. Gilbert Pearce, and to the money and the knowledge of smelting of Dr. Richard Pearce, late of Colorado. Another evidence of the prosperity of this concern is the expressed intention of starting a branch works to the north of Liverpool by the mouth of the Mersey. It is intended to treat at the new works some of the imported ores that come from Bolivia and elsewhere. These ores are at present shipped to Liverpool, and transshipped thence to Cornwall for treatment. Another advantage in having a works at Liverpool is that much of the tin produced is used by the bronze-makers in the north of England. In addition, fuel will cost less than in Cornwall. Cornish smelters do not tell the whole world what they are going to do and how they do it. They do not encourage the visits of strangers or journalists, especially journalists representing American papers. That leads me to take this opportunity of reminding American readers in general and the owners and metallurgists of great American smelting works in particular, that their pleas against secrecy in the arts are all very well for those who have an Anaconda or a Copper Queen in their back yards, but they do not appeal to English custom-smelters, with whom superior technical knowledge and experience is the sole stock in trade. Consequently it is not at all surprising that Cornish tin smelters should keep their business to themselves. Those tin smelters in Cornwall are quiet in their doings altogether. They do not talk of their intention and methods, and they emit no fumes to advertise their presence.

I have on several occasions referred to the litigation between the rival flotation processes, one owned by the Minerals Separations, Ltd., and the other by the Ore Concentration Co., Ltd. The first process is the invention of Messrs. Ballot, Sullman & Picard, and is a development of the Cattermole patent, and the latter is the Elmore vacuum process. I am personally much more familiar with the latter than the former, for I have had opportunities of studying its action at Tywarnhaile and Dolcoath. The Minerals Separation process is not in operation in this country, and is being developed at Broken Hill. Though not familiar with its workings, I have J. H. Curle's assurance that his own experiments on the Broken Hill plant fully bear out the claims of the inventors. The old original Cattermole plant was erected at the Central mine, Broken Hill, belonging to the Sulphide Corporation, and, as I said in an article some time ago, did not give very good results. It is now closed down. The next plant, on an improved model, was erected by the Sulphide Corporation at the Central mine to treat the residues coming direct from the jigs. During the year ended June 30 last, this plant treated 170,000 tons, and produced 64,000 tons of zinc concentrate. The plant does not yet give as good results as the Company counts on obtaining eventually, and gradual alterations are still being made. The next plant erected was the joint venture of the Minerals Separation, Ltd., and the Sulphide Corporation, and its object was to treat the slime-dump at the Central mine, and a dump of slime purchased by the Minerals Separation, Ltd., from the Block 10 Co. This plant treated 8772 tons of Block 10 slime, but is now closed owing to the unsuitable terms available for the sale of the concentrate. A fourth plant has been erected by Minerals Separation, Ltd., conjointly with other parties, to treat the tailing-dumps on the Central mine, which have been purchased from the Sulphide Corporation. This was completed in November 1907, and from that date to June 30 last, it treated about 100,000 tons of tailing and produced 36,000 tons of concentrate assaying 45% zinc, 11% lead, and 15⅛ oz. silver per ton. The recovery is 83% zinc, 66 lead, and 73 of the silver. This plant, if worked continuously, will handle 5000 tons per week, though it was designed to treat only 2000 tons. The cost of the process, including tramming, re-grinding, flotation, and handling residues and concentrate is given at 7s. per ton. In the present state of the metal market it is impossible to get rid of the full output of this plant, and it is being run at lower capacity. It will be remembered that the process was tried for a short time by the Zinc Corporation, afterward giving place to the Elmore vacuum process. Mr. Ballot and the other directors of the Minerals Separation, Ltd., urge that their process had no fair trial there. For one thing, it was tried with a plant that had previously been in operation on another process, and furthermore the working of the process was not in the hands of the inventors' representatives.

I have already mentioned that the slump in metals has had a disastrous effect on most of the silver-lead mines of Broken Hill. The report of the Broken Hill Proprietary for the half year ended May 31 last completes the tale. The Company has certainly made a profit, but it amounts to only £22,776, as compared with £138,000 for the preceding six months, and £308,000 a year ago. In 1902 and 1903 also the profits were very low owing to the fall in metals, and only small dividends were paid. In the old 'carbonate-days' princely profits were made. Later, though the profits were smaller, dividends were still paid monthly. Afterward, when the zinc question came in, dividends were paid quarterly. I think this is the first time that the half-yearly results have not been sufficient to pay a dividend. The output for the last half year was 36,140 tons of lead and 2,529,799 oz. silver. The average prices obtained were £12 11s. per ton for the lead, and 2s. 3½d. for the silver. In the half-yearly statement, the directors make two interesting announcements. One is that the experimental zinc-distilling plant has been such a success that £100,000 is to be spent in erecting a plant which will produce 8000 tons of spelter per annum. The other is in connection with the exploration in depth. Operations at the 1300-ft. level have proved the body to be 26 ft. wide. At the 1400-ft. level the vein is just as strong, varying from 6 ft. to 44 ft. wide, and running 20% lead, 16% zinc, and 14 oz. silver.

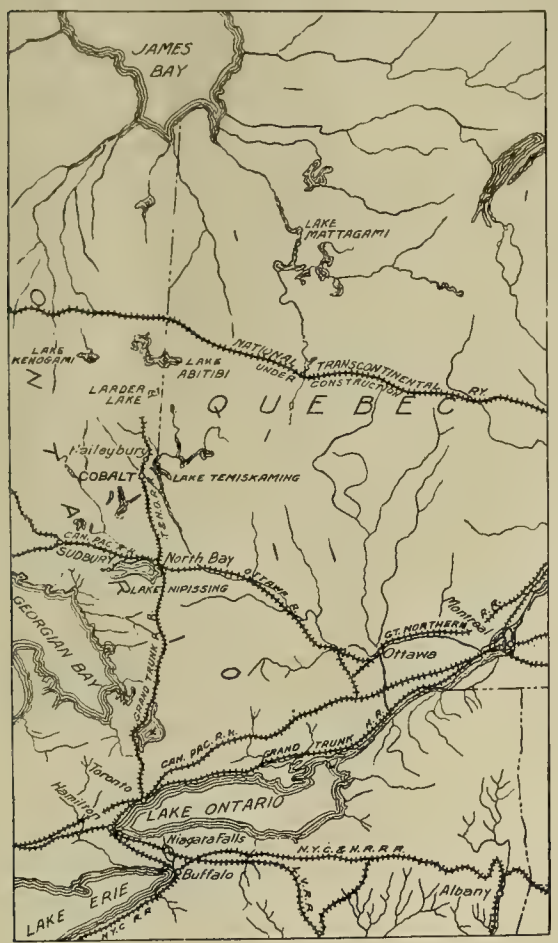
TORONTO, CANADA.

Increased Activity in Mining Circles. — Developments at Cobalt. — Canadian National Exhibition.—Remarkable Mineral and Metallurgical Exhibits.—Excursion of Canadian Mining Institute.

Great activity in mining has prevailed during the last few weeks as regards actual development, production, and the operations on the stock market. The continuance week after week of heavy shipments from the leading Cobalt mines has resulted in an active demand for dividend-paying stocks and a steady upward tendency in prices. This, at first confined to a few of the larger and more firmly established enterprises, has lately affected the lower-priced stocks, and has considerably raised the level all round. La Rose is now regarded as the leader, its shipments, amounting to 2379 tons since January 1, being far in excess of those of any other mine except the O'Brien, which is a good second with 2218 tons. The Princess, included in the La Rose consolidation, is yielding rich ore from a 4-in. vein at the 70-ft. level. A new vein was struck in driving on this vein last week, which assays 4000 oz. silver per ton. At the Temiskaming a rich find is reported at the bottom of the new shaft which is being sunk away from the ore deposits to serve as the main shaft. At 70 ft. a blind vein of calcite, carrying niccolite and native silver, was found, which is stated to be of great width. The Crown Reserve is proving very rich. On the open-cut, now down 63 ft., from which ore valued at $350,000 has already been taken, a block of ore which will yield over $100,000 is ready to break down. A winze is down 20 ft. from the

bottom of this cut, in rich ore. No. 1 shaft is down 75 ft., and No. 2 shaft, some 25 ft. distant, is down 118 ft. A cross-cut has been started at the 110-ft. level to pick up the vein from No. 1. At 20 ft. in the cross-cut a vein 15 to 20 in. wide containing calcite with native silver was found, which is thought to be a continuation of the Silver Leaf vein. Another cross-cut is being run under Kerr lake.

The Canadian National Exhibition, which opened in Toronto September 1, has the finest and most comprehensive exhibit of mining products ever made here. A special collection sent by the Ontario Bureau of Mines, in charge of William Nicol, is of particular interest, embracing specimens from every branch of the mining industry. The Cobalt camp is, of course, strongly in evidence, with samples of ore from the leading mines, the principal exhibit being a nugget of native silver from the Crown Reserve, weighing about 1600 lb., and of an estimated value of $5000. The



Map Showing Position of Cobalt and New Districts in Ontario.

O'Brien is represented by a nugget of 850 lb., and a slab of native silver 4 ft. long, carrying about 90% silver, and also by the finished product in the form of six silver bricks from the Deloro smelter. The manner in which the by-products are saved is also shown by samples of the speiss produced after extraction of the silver, and of the cobalt and nickel oxides extracted from the speiss. The Coniagas Reduction Co., which treats the output of the Coniagas mine at its smelter at Thorold, Ontario, has also been successful in this respect. It is represented by a silver bar 998.4 fine, and specimens of pure commercial cobalt oxide and white arsenic extracted from the ore, indicating the satisfactory solution of the smelter problem, which so long engaged the attention of Cobalt shippers. The La Rose has an instructive exhibit of several blocks of ore, showing the mode of occurrence of silver in association with calcite, niccolite, chloanthite, and other minerals. There is a good showing of gold ores, the leading display being that of the Laurentian mine, in Manitou Lake district, which shows 60 oz. of almost pure gold nuggets, valued at $4000. There is also a full representation of the iron, nickel, oil, and cement industries. The Governments of New Brunswick, Nova Scotia, and Alberta present extensive mineral collections, that of Alberta comprising numerous samples of coal, which occurs extensively in that province.

The summer excursion of the Canadian Mining Institute, which has been traveling in Nova Scotia and Quebec since August 24, visiting the plants of the Dominion Iron & Steel Co., Dominion Coal Co., Nova Scotia Steel & Coal Co., and other prominent concerns, arrived here on September 3, and, after a trip to Niagara Falls, left for Cobalt and other points in northern Ontario. The excursionists, numbering in all about 50, include many noted British and German mining and metallurgical experts, and are in charge of W. G. Miller, Provincial Geologist and President of the Institute. The scientists from abroad expressed great surprise at the extent of the coal and iron industries of Nova Scotia and the thorough equipment of the plants.

MEXICO.

Ore-Settlement in Mexico. — Conditions in Western Chihuahua. — Power-Plant on Guerrero River. — New Mill of Dolores Mining Co.—Installing Plant for Rio de Plata Co.—Improvements Contemplated at Sahuayacan Mine.

The recent excellent showings made by the Dolores, the Republica, the Rio de Plata, and other properties in western Chihuahua are attracting mining men and capital to that region, where it is known that a number of promising but as yet undeveloped properties are situated. There is great difficulty in buying them from the present holders at anything like reasonable figures, as they will not take into consideration the expenses that must be incurred to successfully operate properties in the wild parts of western Chihuahua. Though the completion of the Kansas City, Mexico & Orient railroad will give improved and cheaper transportation facilities, there are many mining companies operating at distant points in Chihuahua, as well as all through Mexico, that have to pay from ₱60 to ₱80 per ton to get their ores to the railroad station. Added to this are many other expenses not known in the United States, which must be taken into account by the mine operator in Mexico. This point is perhaps best illustrated by actual shipments that have come under my notice, from which may be taken one of a lot of concentrate when silver was 56¾c. per oz. The concentrate ran 1130 oz. silver, and 7½% lead, so that the full metal-content paid for in the smelter-liquidation was $612. From this were deducted for railroad freight and smelter charges (the concentrate being high in zinc and sulphur) $21.29; the Federal tax on the silver amounted to $22.71 (deducted by the smelter as a convenience to the shipper); so there was left an apparent net smelter-return of $568 per ton. But in Mexico there must go with every settlement for ore a regular bill of sale which must be stamped by the seller at the rate of one-half of one per cent, or five cents for each $10, making on the above ore $2.84 per ton. Then there is a State tax (in Chihuahua of 1% on concentrate, and 1½% on ore), to the receipt for which must be affixed Federal stamps amounting to 20% of the State tax, or, for concentrate being considered, $5.69 State tax, plus $1.12 in Federal stamps, a total of $6.80 per ton to pay the State taxes. And to get the concentrate to the railroad the shipper had to pay $65 per ton for burro transportation. The total charges then against the $612 were $118.64, of which the State and Federal Governments got $32.35, or 5.29%. From the remaining $491.36 had to still be paid the cost of mining, milling, and operating. Is it strange then that the investor hesitates, even over a remarkably rich property, unless it can be obtained at reasonable figures? Stamps on pay-rolls, books, and various other papers will easily bring the 5.29% contribution to State

and Federal Governments up to 6% of the gross value of the output of the mines, and from this charge there is no escape, no matter what the method of treatment. In fact smelting makes it slightly less by reason of the deduction for smelting charges before calculating stamps on the bill of sale. But the high transportation charges, which only the highest-grade ore and concentrate can stand, has forced the operators to put in mills, and in western Chihuahua the ore is usually of a character that permits of concentration followed by cyanidation. This for over a year has been the treatment at the plant of the Dolores Mining Co., in the district of Guerrero, Chihuahua. The August output was 84 bars of bullion, valued at ₱146,000, and about 20 tons of concentrate assaying about 600 oz. silver and 15 oz. gold per ton. This Company has about completed its dam on one of the tributaries of the Guerrero river, and will soon have its hydro-electric plant installed so as to run by electricity at both mine and mill for the greater part of the year. The Republica Mining Co., in the Rayon district, holds about 400 acres including 8000 ft. of the outcrop of the vein. It is stated that 12 ft. of 175-oz. ore has been opened up on the 300-ft. level. The Company has completed and has put in operation its 10-stamp mill, including Wilfley tables, tube-mills, and Butters filters. The mill will be enlarged to 40 stamps as soon as development work permits, but up to the present time the shipments have been about 50 tons per month of 1000-oz. silver concentrate, with no gold. As yet, however, if I am correctly informed, the Company has made no shipment of bullion. The Rio de Plata Mining Co., in the Guazapares district, has had its 30 stamps in operation for almost a year, producing 30 to 40 tons monthly of 2000-oz. silver concentrate, and since the first of July has been operating by water-power. This Company is now busy installing tube-mills and a cyanide plant and also a Moore filter plant for the treatment of tailing. The Batopilas company has for several years kept its freight bill down by shipping bullion instead of ore and concentrate; the Watterson Gold Mining Co. placed itself this spring in shape to do the same; and the Sahuayacán, which is preparing to resume operation, will probably soon do likewise. It is almost imperative that they do so.

ANTIOQUIA, COLOMBIA.

The Road to the Cauca Goldfields. — Scenes on the Way. — Steam-Shovel Work at Panama. — Widening the Culebra Cut. —Chief Difficulties in Canal Construction.—Port of Barranquilla. — Entrance to the Cauca Valley.

I sailed from New York July 4, 1908, on the Hamburg-American steamer *Prinz Joachim*. As I looked over the passenger list and learned something of the nature of the cargo, it appeared to me a disappointing and mortifying fact that a ship carrying 80% American passengers and 95 to 100% American freight should sail under a foreign flag, and when I arrived in Colombia I was further mortified to find that nearly all of the trade with the United States is in the hands of German houses. Similar conditions exist in other South American countries. The German in these countries is essentially a trader. He does little to develop the country in which he settles. He marries and amalgamates with the people for purposes of trade, claiming nevertheless his German allegiance for obvious reasons in times of trouble, and he prospers above all others.

The first call was at the port of Kingston, Jamaica, now arising with painful slowness from the ruin of the recent earthquake. To my surprise I found the place dirty and uninteresting, manifesting all the tendencies of negro shiftlessness in spite of the usually excellent British Colonial Government. Left to themselves I believe these people would rapidly drift to disorder, and be little better than Hayti and Santo Domingo. From Jamaica it is a run of 20 to 24 hours to Colón on the Isthmus. I had expected to spend three days there, but was forced to rest content with one. A short stop at Culebra and over-night at Panamá was the best we could do. To anyone familiar with steam-shovel work in the Lake Superior iron mines and at Bingham, Utah, the magnitude of the Culebra cut did not seem remarkable, although as to efficiency I doubt if it has ever been exceeded. Having but a few hours to go over the work, I was unable to study the rocks, but I judge them to be mostly eruptive tuffs and agglomerates. The Culebra hill is decomposed to a great depth, hence the shovel-work is easy. The slopes are benched, the cars and shovel being on parallel tracks upon each bench. As fast as a train is loaded, another train of 'empties' takes its place, and the work proceeds with marvelous dispatch. The ground is broken by drilling a series of holes on the line of the bench with light (4-in.) churn-drills operated by compressed air, the boiler of the (Star) drill acting as a reservoir for the machine, and utilizing a compressor-plant originally intended for ordinary air-drills. The large holes made by these churn-drills enable big charges of explosive to be used, and enhance the efficiency of the work with a saving of labor and perhaps no greater expenditure of explosive. It is generally conceded that the Culebra cut is the key to the whole operation, that the length of time necessary for its completion determines approximately the time necessary for the completion of the work. To my mind the difficulties of this cut are relatively small as compared with those incident to the construction of the locks and dams. With the highly efficient system now in operation at Culebra, it will, I believe, be possible to excavate cheaply a much greater cube than was originally expected long before the locks are completed. It seems certain that the slope of this cut will have to be much flatter than was expected. As the soft decomposed volcanic material is exposed to the air and rain it sloughs off, and rolling down it would choke up the water-way and be a constant menace to passing ships. Hence the present slopes must be opened out wider, or revetted in some way, which would seem objectionable and in the end would be more expensive. It would seem, therefore, that the probabilities are, that nearly double the amount of material will have to be eventually moved at Culebra than was originally expected. The sanitation of the Canal Zone has justly received praise and is a triumph of what science, system, and unhampered authority can do. Mosquitoes are very scarce, and instead of thousands of cases of fever as under the French regime, there are now scarcely dozens. On the whole, I believe the Panamá Canal will be an undertaking of which the Nation may well be proud. A day and a half after leaving Colón brought me to Sabanilla, the port of Barranquilla. A little 'one-horse dinky' railway of English construction and management connects the two places, which are some 17 miles apart. Sabanilla is a mere roadstead and shallow at that. The railway company has constructed a long flimsy pier out to deep water. Should this decrepit structure collapse, Sabanilla would cease to be a port, and this great territory of Colombia would lose its most important trade centre. Barranquilla is quite a large town, built upon the west side of the delta of the Magdalena. Being upon sand it is healthy. It has one good hotel, very fair shops, and the people are courteous and obliging. This town could be easily made a good port and harbor, were the bars at the mouth of the Magdalena removed and docks furnished for the shipping. This, however, would involve an expenditure of sums of money quite beyond the purse of the town of Barranquilla, and possibly of the Government of Colombia itself. This would, however, connect the sea-borne commerce directly with the great system of inland navigation offered by the Magdalena river and its tributaries. The case is like that of the Mississippi and New Orleans. I found a powerful gasoline launch which had been sent down from New York, awaiting me at Barranquilla, but as it had been shipped through a German house, and by them turned over to the tender mercies of some Colombian engineers, its engine and electrical appurtenances were in hopeless confusion. It took an experienced man four or five days to put the boat in order. From this follows the moral, not to trust your machinery to South Americans unless you are on hand yourself. The

Magdalena river system is navigated by shallow-draft boats, precisely like those on the Mississippi river, having high-pressure non-condensing engines, using wood for fuel. The passenger accommodations are fair, and the freight rates appear moderate, considering the distances traversed, the sparsity of population, and the difficulties of navigation.

Two days on a river-steamer bring the traveler to Magangue, a town of some importance a few miles below the Boca Cauca, or mouth of the Cauca river. From here I went up the Cauca river in a gasoline launch, towing a large canoe with provisions, gasoline, and other supplies, the distance from Magangue to Cáceres, where I now write, being about 160 miles. Where the Nechi river joins the Cauca the auriferous gravels, which have made Antioquia notable, begin to be found.

BUTTE, MONTANA.

Resumption of Boston & Montana.— Belmont Shaft Enlarged. — Ben B. Thayer on the Copper Situation. — Tuolumne Copper Co. — Dredging Plant of British-Butte. — Action for Redress by Butte & Superior Co.— Ticon Mine. — Effect of Wyoming Coal Strike.

All of the mines of the Boston & Montana Co. have resumed operations after a shut-down of three months. The Leonard, West Colusa, and East Colusa mines were operated during most of the time, and the ore shipped to the Washoe smelter at Anaconda, but the two other big mines of the Company, the Pennsylvania and the Mountain View, were closed. These produce about 2200 tons of ore per day. The concentrator at the Great Falls smelter was started on September 1, and the blast-furnaces will be started during the coming week. The Mountain View mine opened a week ago, and the Pennsylvania last Monday, about 900 men being added to the Company's payroll. No more ore is being shipped to the Washoe by the Company. On the first day of shipments to the Great Falls smelter the Great Northern railway hauled 2689 tons, and the next day 2800 tons. The Boston & Montana ordinarily mines from 3500 to 4000 tons per day, the average being about 3600 tons. It is likely that the September copper production of the Butte district will reach, or exceed, 30,000,000 lb. of copper.

The Anaconda Co. has completed the enlargement of the shaft of the Belmont mine, which is now of the standard, 3-compartment size. When it is re-timbered new boilers and machinery will be installed. The machinery of the Corra mine, owned by the Butte Coalition Co., may be used. The Belmont shaft is connected with the workings of the Anaconda mine at the 1600-ft. level.

Ben B. Thayer, assistant to H. H. Rogers, president of the Amalgamated Copper Co., is in Butte, engaged in making his semi-annual inspection of the Amalgamated mines, smelters, and other properties. Mr. Thayer is very optimistic about the future of the copper industry, and the business of the country in general. "Improvement is slow but steady," he said. "Copper is selling today at 13½ to 14c., and everyone looks for a steadier improvement from now on, but I think it may be somewhat slow until after election. There is no doubt in the world that the marked improvement in the steel business and railway supplies means that the railroads themselves are experiencing improving business. Bumper crops are expected and the railroads will have to put in use many of the idle cars. The demand for copper is bound to increase as general business increases, and I look for much better prices very soon. There is nothing in the talk about a surplus copper supply. I do not think that the supply in the hands of the producers has ever been much less than it is now, and it is a well known fact that consumers are working from hand to mouth, and have not yet come into the market for their normal supplies."

The Tuolumne Copper Co. has given a contract to the Erie City Iron Works for six additional 150-hp. boilers, which will give the Company a total capacity of 900-hp. for its hoisting plant, air-compressor, and pumping machinery. The boilers will be of special construction, to stand 150 lb. working pressure. They will require a building 80 ft. long. They are also to be constructed with a gravity system for disposing of ashes, through a tunnel under the boilers. The Tuolumne Co. reports continued improvement in the orebody which is being developed on the 1000-ft. level. A vein 26 ft. wide has been cut and driving is being done on it. It is said to contain 4 ft. of rich ore, and it is the intention of the Company to open it on the 800 and 600-ft. levels. The orebody is not, however, continuous, for the vein was cut farther eastward and found to contain little of value there. The Company feels so confident of the permanency of the ore deposit and extent of it, that it ordered a new Nordberg first-motion hoisting-engine some time ago. Two large ore-bins were recently completed, each having 300 tons capacity.

A large quantity of lumber and machinery for the British-Butte Mining Co. has been delivered on the Company's placer-ground west of Butte and the work of erecting the $80,000 dredging-plant has begun. The pit in which the dredge will be first operated is 150 ft. square and 12 ft. deep. Only 7 ft. of water will be required to float the dredge, and three large dams have already been completed. They have a capacity of 10,000,000 gal. of water, which will be held in reserve for dredging operations. A five-year contract has been entered into with the Butte Electric & Power Co. for electric power. The dredge has a capacity of 2500 cu. yd. of ground per day, and 300 hp. will be required for its operation. The Company owns, or rather claims, about 1000 acres of ground, but the Government is contesting the Company's right to all of it on the ground that it is not valuable for placer mining, though the Company's manager claims it will yield an average of 50c. per cu. yd. The ground was taken up originally by the promoters of the British-Butte as quartz ground, and the Company was floated in London as a copper proposition, notwithstanding that there is a gravel deposit more than 1000 ft. deep, bed-rock not having been found anywhere, though a shaft 700 ft. deep has been sunk through it.

The Butte & Superior Copper Co., Ltd., owner of the Blackrock group of claims lying north of the North Butte mines, has become involved in litigation with John McAlpine, a millionaire lumberman of Duluth, and one of the Company's stockholders, which may result in interminable and serious controversy. McAlpine is being sued by the Company for $8000 due on stock subscription and he refuses to pay on the ground of fraud and misrepresentation. He makes serious charges and for several weeks has had two attorneys in Butte looking up the affairs of the Company and the value of its properties. There was much talk of an unfavorable character about the organization of the Company and its floatation by John H. Simpson, Amas P. Peak, and W. H. Harriman, who were said to have taken an unusually large profit for their services, but it was not known that any blame attached to the present management of the Company, A. B. Wolvin and associates. McAlpine claims that he was deceived, and that there was another big profit-sharing after the property and Company passed out of the hands of Simpson and his associates. He charges that the Blackrock mine, which was turned into the Company for several million dollars, was worked out and abandoned by W. A. Clark, the former owner. The Company is capitalized for $6,000,000, but in an annual statement filed for record with the Secretary of State the Company values its property at $8,000,000, and says that more than $2,000,000 were actually paid for the property. McAlpine is trying to disprove that. McAlpine was one of many persons taken in 'on the ground floor' by the promoters, paying $4 per share for the stock. The Company could not dispose of its treasury stock, and it became necessary to issue $500,000 first-mortgage bonds in order to raise money to pay options coming due, and to provide a development fund. From the start the Company has been badly managed, and the result of two years' work and the expenditure of much money is an addition of 700 ft. to the Blackrock shaft, which has been sunk from the 500 to the 1200-ft. level. The Blackrock

has a large vein, but it has never produced anything but silver, and the silver deposits were practically worked out years ago. The present Company is sinking for copper and has found good assays from the 500-ft. level down. The Anaconda mine, which was first mined for silver on the upper levels and then turned into the richest copper mine in the world, yielded good copper returns at the same time, though the ore was not treated for its copper content. It is different with the Blackrock; that never yielded copper. The other developed claims in the Blackrock group, like the Niagara and Raymond, have also been exclusively silver producers.

Operations have been resumed on the Ticon mine by James A. Murray. The shaft has a depth of 500 ft., but the work is being done on the 300-ft. level, where a winze has been sunk to the 500-ft. level. The Ticon is between the Bell of the Anaconda Co., and the Speculator of the North Butte Co., both good copper producers.

The State School of Mines, situated at Butte, has installed a small sampler and plant for making smelting tests. The school will treat ore free of charge.

The life of the Butte Central & Boston Copper Corporation seems to be drawing to a close. At a meeting of creditors in a bankruptcy proceedings in Butte claims aggregating $158,000 were accounted for, and of that about $30,000 are preferred, suit having been brought on them four months prior to the beginning of the bankruptcy proceedings. A trustee in bankruptcy will be appointed in a few days.

The strike of coal miners in Wyoming may have a serious effect on mining and smelting operations in Butte and Anaconda. Ninety per cent of the coal used in Butte comes from the mines of Wyoming, which are now shut down. A supply sufficient to run the companies about six weeks longer is on hand, and this is being augmented by shipments from Montana mines, but the latter cannot furnish all the coal needed. The Amalgamated Co.'s principal source of supply is at Diamondville, Wyo. It is possible that the Montana coal miners will become involved in the trouble, as their contract with the operators will expire October 1. They are demanding a renewal of the present contract, while the operators insist on changes and reductions.

SALT LAKE, UTAH.

August Copper Output from Utah. — Operation of the Garfield Concentrators.—New Equipment at Yampa Smelter.—Dividends Declared.—New Consolidation.

The August production of copper for Utah ran close to 8,000,000 lb. Actual figures are difficult to obtain; nevertheless, the foregoing is approximately correct. The Garfield smelter of the American Smelters Securities Co. is credited with 6,500,000 lb.; the Yampa in Bingham canyon, with 800,000 lb. of blister copper; while the Independent smelter near Ogden turned out 150,000 lb. of matte, which is shipped to the United States Smelting, Refining & Mining Co.'s refinery at Chrome, New Jersey. Practically no ore is being received at the Garfield smelter now, other than that coming from the three principal customers of the plant; namely, the Utah Copper, the Utah Consolidated, and the Newhouse mines. Because of the difficulty experienced in treating the fine concentrate from the Garfield concentrators, the Boston Consolidated, as I have stated in another letter, is not sending its mill product to the smelter at the request of the management of the Garfield plant; but is permitted to draw on the smelting company to the extent of 85% of the assay value of the ore, final settlement to be made after the first of next January on the basis of prevailing copper prices at that time. This plan is in accordance with an agreement recently entered into.

The showing made by the Boston mill in August was a gratifying one, and has created much favorable comment. While the Utah Copper Co. has released no figures as yet on the result obtained at its plant during the period, the impression is abroad that the balance has been slightly in favor of the Boston Consolidated. Anyway, the Boston mill made an average extraction of 71.8% and the milling costs did not exceed 50c. per ton for the treatment of 25,000 tons of the Bingham porphyries, which averaged 1.8% copper, and yielded a concentrate averaging slightly above 21%. The behavior of the two Garfield concentrators will no doubt be watched with keen interest during the next few months. One of them, the Utah Copper, is equipped with gyratory crushers and Chilean mills; the Boston Consolidated employs gyratory crushers and Nissen stamps, and the ore treated is identical. A feature of the Boston mill which appeals to the observer is its simplicity, leading to the conclusion that the cost of maintenance will be low.

The Yampa smelter in Bingham canyon is producing 15 tons of blister copper per day, which means that the monthly output will aggregate from 900,000 to 1,000,000 lb. monthly. The new equipment installed last month, which includes a converting plant, is working satisfactorily. A shipment of blister copper made a few days ago assayed 98.5%, besides containing from $175 to $200 per ton in

Map of Utah.

gold and silver. Utah Consolidated continues to produce the tonnage allowable under its contract with the American Smelters Securities Co., which is 800 tons per day. The question of a five-year contract with the smelter has not been definitely settled, but probably will be this month, and on the outcome depends whether the Utah Consolidated Co. will proceed to carry out its plans to build a smelter in Tooele county. On the basis of 13¾c. copper the Company should be showing the largest profits per pound of copper of any producer in the United States, or a profit of 7¾c. per pound; that is, after crediting precious metal values against the cost of copper.

Regular monthly dividends will be posted this week by the May Day, Colorado, and Uncle Sam Consolidated Mining companies. A quarterly distribution will also be ordered by the Silver King Coalition Mines Co. A consolidation of the Skylark Copper Mining & Milling and the Wasatch Mining & Milling companies has been effected and the Utah-United Copper Co., organized to take them over. The new corporation has strong backing and proposes a vigorous campaign of development. The properties involved in the transfer are in the Beaver Lake district in Beaver county. One furnace of the new Tintic smelter is in commission and the second one will be within a week. Equipment for two additional lead furnaces has begun to arrive.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Safety-valves of the lever type should have an opening of 1 sq. in. to every 2 sq. ft. of grate surface in the boiler.

Milk of lime is formed by slaking lime in an excess of water. It is used for many manufacturing purposes, notably in the textile and tanning industries.

Old paint brushes may be effectively cleaned by first soaking in hot kerosene and then cleaning in a mixture of one part of acetone and two parts benzole, or coal-tar naphtha.

Handling plate-glass by lifting-magnets has been successfully accomplished by placing the magnets against the plate of glass, on the opposite side of which is a flat plate of iron or steel.

Dry batteries may be re-charged by soaking in a solution of sal-ammoniac for 48 hours, if a dozen or so ¼-in. holes be first drilled through the zinc shell. These holes may later be plugged with hard soap.

Abandonment of a mining claim is a question of fact, and the fact is to be found in the intention. If, after doing his annual labor, a miner should deliberately quit his claim with the expression of his intention not to return to it, or should give permission to others to occupy it as their own, such manifest proof of intent would establish abandonment. Ceasing to work because the ore is not salable does not constitute abandonment.

Simpson's one-third rule gives the area of the surface lying between an irregular curved boundary and a straight base-line. The rule is as follows: divide the base-line into an even number of equal parts and erect ordinates at the points of division; then add together the first and last ordinates, twice the sum of all the other odd ordinates; multiply the sum by one-third of the common distance between ordinates, and the product is the area.

The azimuth of Polaris at elongation is not the same as its polar distance, since the former is a horizontal angle. The azimuth of any star for a given point may be calculated by the following formula:

$$\sin A = \sin D \div \cos L,$$

in which A is the azimuth, D the polar distance of the star, and L is the latitude of the place of observation. The mean polar distance of Polaris for 1908 is 1° 11′ 03.71″, and for 1909 it will be 1° 10′ 45.07″.

Longitude is determined by a comparison of local and standard time. Local time may be determined by means of an ordinary transit to the nearest second, and if a good watch, whose rate is known, be used for comparison with standard time sent by the telegraph companies, the longitude should be accurate within 15 seconds. However, for the purposes of the ordinary determination of meridian by solar or stellar methods, longitude can be obtained with a sufficient degree of accuracy from a good map, provided, of course, that the geographical position of the place of observation be known. The U. S. Geological Survey publishes maps on the scale of 1 in 125,000, and the longitude and latitude may be easily scaled from such maps to the nearest 15 seconds.

Acceleration of gravity is not of constant intensity over the earth's surface, but is greater at the poles than at the equator, and is also greater at sea-level than at high altitudes. The following formula gives g in feet for any latitude, l, and any elevation, e, in feet, above sea-level:

$$g = 32.0894(1 + 0.0052375 \sin^2 l)(1 - 0.0000000957e).$$

The greatest value of g (32.258) is at the sea-level at the pole, and the least value (32.059) is on high mountains at the equator, and the mean of these extremes (32.16) is commonly used as an average figure.

The horizontal hair of an engineer's transit should be in the plane of motion of the optical centre of the objective. If this condition is not satisfied, the line of collimation will change with every change of the object-glass, rendering the instrument useless for leveling, or for measuring vertical angles. This adjustment is not usually included in text-book discussions of adjustments of transits. Nevertheless it is an important one in adjusting every transit which is to be used for anything except the measurement of horizontal angles. To adjust the horizontal hair, drive a stake near the instrument and read a level-rod upon it; then, without moving the telescope in altitude, read a rod upon a second stake 200 or 300 ft. distant. Reverse in altitude and azimuth and bring the telescope to the former reading upon the first stake; then read upon the other stake. If this reading is not the same as before, correct one-half the difference by moving the horizontal hair. Repeat the process for a check.

Lithium, the lightest of the metals, is used in commerce, chiefly in the form of the chloride and other salts, as a medicine. These are beneficial in gouty affections, on account of the fact that lithium salts react with uric acid, forming extremely soluble urates, which are readily eliminated from the system. The principal sources of lithium are lithia mica, or lepidolite, a translucent mineral of pearly lustre, having a very complex chemical composition, and spodumene, which is a simple silicate of alumina and lithia. Lepidolite contains from 4 to 5% of lithia (that is, lithium oxide), while spodumene contains from 7 to 8%. These minerals have been found in such quantities in San Diego county, California, that the market is over-stocked, and will probably remain so for years. Amblygonite, however, could be disposed of. This is a fluo-phosphate of alumina and lithia, containing 4.8% of phosphoric acid and 10% of lithia. It forms coarse crystals of pearly lustre, and usually pale-green to bluish color.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Ethics of Technical Writing and Technical Writers.

The Editor:

Sir—'Rezongador,' in your issue of August 29, naively suggests that technical writers should make their information as detailed and as truthful as possible. Who are the technical writers? There are those whose work is a labor of love, who carry on investigation from the pure love of discovering the truth for its own sake, who collect their information in the laboratory or works, and who are free to publish what they are willing to publish without mental reservations.

There are those who admit that it is the duty of all, if they can, to add to the general store of knowledge, but who would never publish anything except at the solicitation of the technical editor who may think they are in a position to know something of general public interest, and will then use his persuasive powers to get the information for the benefit of the public. There are others who are possessed of the passion for writing and the vanity of the notoriety of publication. There are others again who deliberately write for the purpose of self-advertisement, and to keep their names before the public. What is to be the attitude of the student or layman or constant reader before the chalk and blackboard of these professors, quasi professors; before the man who loves to be the first and loudest speaker everywhere and does not wait for an invitation, and before the man in the back seat who has been spied out by the chairman presiding over the meeting and called to the platform.

It is suggested that the information should be as detailed as posible. One is privileged to assume that the readers of a technical journal know something of the subject, and is therefore justified in avoiding obvious and rudimentary detail. He should no doubt give all the details he can which are not obvious and rudimentary, and especially those which would serve to illuminate the presented facts on more sides than one, if such details exist. That he should believe all his statements to be true, and not conceal anything that he fears might throw doubt upon them, goes without saying. What advice would we give to the student about the faith he should place in published technical statements? I believe that the final lecture of every professor on dismissing his students should have for its subject 'Efficiencies.' It should warn the student that these may never be 100%; that they may be very much less. He could give many illustrations, and would be justified in pointing out that published efficiencies are generally too high. The yields are generally over-estimated and the losses under-estimated, not from any desire to deceive, but because a man describing a process will be more apt to pick out for illustration a good period than the worst, one that is above rather than below the average. The greatest danger that besets the student in his entrance years into practice is a too great confidence in published 'efficiencies.'

Rezongador knows this as to certain published milling results. We know this as to almost all classes of published results, electrical, mechanical, and others. The student should be trained to adopt toward all such results, even those to be found in the text-books and the manufacturers' catalogues, an attitude of respectful but firm criticism, recognizing the results as entirely correct and honest so far as they go, but that they do not go so far as average practice year in and year out, but represent a practice unaffected by accidents, carelessness of employees, delays of starting and tuning up a plant, training of the personnel, strikes, and a thousand other causes, like the furring of boiler-tubes with scale, the uneven wear of rolls, the leakage of the piston, and the weakening of the insulation.

Technical writers should be careful to state, when they can, their opinion upon the efficiency-results they publish; whether they are average or otherwise. In the case of milling tests, if the heads have not been systematically and properly sampled, that should be emphasized. I remember a story of an old game-warden who, when breech-loading shotguns were being introduced, was asked for the first time to look down the opened shining barrels of the new gun. He remarked that if they could do that with the muzzle-loaders there would be some "awful revelations." If we could look into tailing dumps, slag dumps, and efficiencies of plant and machinery all around, there would be some awful revelations.

ESCRUTADOR.

San Francisco, September 2.

Gold-Dredges, Large and Small.

The Editor:

Sir—Noticing the editorial in your issue of August 15 on 'Gold-Dredges, Large and Small,' I note that you make the following statements: "It is interesting chiefly as showing that a need exists for economical gravel excavators of small cost and moderate capacity, and that meagre attention has been paid to it by engineers of training adequate for reaching successful solutions of the problem." Again you say, "the attention of engineers might advantageously be directed to the design of small as well as large gold-dredging appliances."

I desire to call your attention to a form of gold dredge designed by me for the New York Engineering Co., which meets these requirements, as I have fully appreciated the long-felt want for a small gold-dredge that would have a moderate capacity of about 1000 cu. yd. per day, and that would be an efficient and practical operating mechanism, and yet not be so expensive in first cost as the regular standard type now on the market.

This dredge is of the regular California type in form, embodying every improvement and detail as employed in the larger sizes, only it is equipped with smaller buckets, and consequently all other parts are lighter. The main feature, however, is that it has a

steel hull, and all of the gantries and superstructure are of structural steel, that is, built up from I-beams, angles, and channels, in the form of latticed girders, in the same way as the steel skeleton of a modern office building. The hull is made up of angle-iron frames, thoroughly braced and stayed, and of similar form to the frames used in wood-hull construction, and the outside or sheathing is of sheet-steel. The gantries and superstructure are all of the latticed-girder type, and form a Howe-trussed girder extending the full length of the dredge, thus retaining the modern form of bracing and superstructure that is now employed in the construction of large dredges with wood hulls. This steel form of construction has a most important bearing in cutting down the final cost of the complete dredge, as described hereafter. This dredge has a bucket-line of modern type, equipped with buckets of 2 cu. ft. capacity, of the same style and proportionate weight as the latest California buckets, that is, they have a heavy cast-steel base, with wrought-steel hoods, and manganese-steel lips. The upper and lower tumblers have renewable wearing faces and the lower tumbler runs in waterproof bearings; in fact, all of the features of the later type of dredges are utilized. An interesting feature is the extremely low cost of the dredge when completed and ready for operation, especially in inaccessible regions, where all of the timber required in the construction has to be brought in from the outside. This is generally essential in the tropics, owing to the inefficient facilities for getting out the 100,000 ft. of lumber usually required, and often because the native timber is not of the right quality and character for this kind of work. Thus the large saving in final cost is due to the fact that the dredge is built completely of steel, and is assembled in the shop, and all parts are drilled and fitted to place. The only work involved is the riveting together of the steel work, and the bolting of the machinery in place. This requires very little skilled labor and only a small amount of common labor, and does away with the ship-carpenters and mill-wrights usually required in the building of a wooden hull machine.

The second important saving in costs is in the items of freight and haulage, as the steel hull weighs only one third as much as the wood hull. The freight and haulage charges with wood construction are usually a large item, and in some instances have been known to amount to as much or more than the initial cost of the machinery. The low final cost of this dredge is not attained by sacrificing quality or weight in the machinery, as this is fatal in dredging practice, but is attained by the saving in freights and haulage, and especially in the large amount of labor usually required in the assembling and erecting of a dredge with a wood hull. This dredge is not designed to operate in hard cemented gravel containing large boulders, as such ground can only be handled by a heavy dredge, with larger buckets. It is intended as an equipment suitable for a piece of ground containing a limited amount of gravel that will not warrant a more expensive equipment. The cost per cubic yard of material handled by this dredge will naturally be higher than that of the larger machines. Nevertheless, it will fill a need and provide a means for exploiting placer properties that have not been worked heretofore owing to the lack of such an apparatus.

A. C. Ludlum.

New York, August 27.

Separation of Slime.

The Editor:

Sir—In a letter appearing in your issue of July 25, H. T. Willis discusses the question of the 'Separation of Slime,' in connection with H. G. Nichols' article of April 25. From the point of one who is greatly interested in the subject, it would seem that as a reply to a contribution bearing on its face the evidence of very careful and exhaustive work, Mr. Willis' remark that other metallurgists have embodied all the principles alluded to and have carried the subject still further, in another process, is somewhat

Free-Settling of Slime.

inadequately brief. Mr. Willis' subsequent remarks lead one to suspect that possibly he has a different process in mind, for instance, his contention "that enormously greater amounts of solution required to be pumped" suggests that he has not quite grasped the salient feature of Mr. Nichols' process, and further, his remarks anent "depth and diameter of vat" lead to the conclusion that he is thinking of a continuous decantation method, a very different idea. It would certainly seem, moreover, that Mr. Willis is in error in regard to pulp acting like a dense liquid. Mr. Nichols has dealt with this point in his article appearing July 11, page 54, in the Mining and Scientific Press, and has pointed out the great importance of avoiding this mistake.

The question of free settlement, and all that it implies in practice, requires careful thought. Let it be understood that the scope of the present discussion is in connection with one phase of free settlement.

R. H. Richards has given us most important data regarding free settlement, as affected by size and specific gravity of particles, and his deduction regarding the law of viscous resistance must enter into any consideration of the subject. The particular phase referred to is, of course, that in connection with retardation due to accumulation, and thus far it has not been, apparently, studied with regard to size and specific gravity of the solid particles. Whether such a study would be of practical value is not at the moment suggested, but certainly a field for investigation might be possible along these lines, for instance, to what extent is it an advantage to have varying sizes and specific gravity of particles in a settling-charge, as finely ground quartz in clay slime?

A charge of any density may be tested for free settlement by using the simple apparatus shown in the photograph reproduced herewith (which is Mr. Nichols' Fig. 2, slightly modified). Here, in place of a stop-cock, a piece of flat rubber is drawn up against cork-connecting bottles. Any water may be drawn from the upper vessel, and a known charge introduced. In the photograph the pulp which settled contained 30% of the finest clay, and the actual time between the introduction and the exposure was 6 seconds. Owing to the difficulty of securing such a photograph, the principal feature to be noted is lost. The clotted slime, as it accumulated, could be plainly seen falling through the cloudy solution, but could not be photographed.

T. S. Lawlor.

Nelson, British Columbia, August 17.

Cornish Pumps of New Design.

The Editor:

Sir—I have read with interest E. P. Jones' letter in your issue of January 18, and also the letter from 'Old Timer' of March 4, on the subject of Cornish pumps. The pumps described by Mr. Jones, and of which you produce an illustration, can hardly be called of 'new design,' seeing that that particular type has been in use considerably over twenty years. It is an improvement on the original Cornish type with 'H-piece,' but it is not suitable for deep lifts. The valves also are only suitable for light pressures, of not more than 250 ft. The tendency nowadays is to increase the lift on each plunger, thereby decreasing the number of parts, and reducing the cost both in machinery and underground excavation. By carefully designing the valve-boxes, and by using an improved type of valve, this has been made possible and lifts of over 1000 ft. are not uncommon.

The old single-cylinder type of Cornish engine was the most economical pumping-engine built when worked at the steam-pressures (40 to 50 lb.) in vogue in the middle of the last century.

The increase in steam-pressures has sealed the doom of this type of pumping-engine, for with the Cornish engine it is not possible to cut off earlier than $^1/_4$ to $^1/_5$ stroke, owing to the great stresses set up in the pump-rods. The Cornish cycle is an ideal one, and particularly adapted to metalliferous mines, as the single line of rods takes up but little room in the shaft. The use of higher steam-pressures introduced various types of engines for pumping purposes, one of the commonest being the compound rotative engine coupled to the pump-rods by gearing and angle-bobs. This type has not proved a great success, owing to the heavy cost of maintenance, to its reduced efficiency caused by the gearing, and to its inability to adapt itself to varying amounts of water. This latter fault is particularly objectionable during sinking operations.

A description of the plant at the Waihi mine may be of interest. There are three Davey compound Cornish engines, working with a steam-pressure of 150 lb. per square inch; the largest is capable of raising 1500 gal. of water per minute from a depth of 1600 ft. Each engine has a high and low-pressure cylinder. Steam is used in the high-pressure cylinder on the Cornish cycle, and is then transferred to the low-pressure cylinder, where the same cycle is also gone through. By this means the economy due to the use of high-pressure steam is taken advantage of, and in the particular engine under notice, steam is expanded 14 volumes, as compared with 4 or 5 in the old type. The water-load is also increased from about 16 to 20 lb. per square inch in the old type, to 30 lb. in the new type (referred to the low-pressure cylinder). The engine is fitted with plungers 23 in. diam. by 12-ft. stroke, and arranged for an initial lift of 700 ft., the plungers below this being placed every 300 ft. apart, to suit the levels. There are five suction and three delivery valves on each pump, the valves being of the double-beat type, with gutta percha beats. The lift of the valves is 1¼ in. and rubber rings around the spindle cause the valves to close quickly and prevent jar. The valve-boxes are of simple design, absolutely free from the defects of the old H-piece type, and changing of the valves is accomplished very quickly. We have used a bucket-pump (17 in. diam.) on one of these engines with a lift of 330 ft. with complete success, the bucket-rings being of gutta percha, and the valve of the double-beat type with gutta percha beats.

The combined efficiency of the plant, that is, 100 times water-horsepower divided by indicated horsepower, in ordinary working is about 82%, and the steam used in ordinary every-day running is about 17 lb. per indicated horsepower-hour. These figures are unfair to the engine, as it is at present not running up to its capacity, and it should, I think, come well under 15 lb. of steam per indicated horsepower-hour on full load.

The combined efficiency of any other type of heavy mining plant is less than this. With a geared engine we cannot reasonably expect to obtain a greater combined efficiency than from 70 to 75%; with electrically driven three-throw pumps about 50%; and with electrically driven turbine-pumps anything below 50%, according to the load factor. The above remarks refer to mine drainage. In a waterworks plant these figures can be much improved upon. Take the case, for instance, of the triple-expansion Hathorn-Davey engine at the Rand waterworks, where the duty was 172,000,000 per 1000 lb. of steam,

and the steam-consumption 10.3 lb. per indicated horsepower-hour, the head being 975 ft. in one lift. This type, however, is not suitable for mine-drainage. With the pumps described above no air-vessel has been provided, and it has not been found necessary to fit one, the pump being perfectly quiet and free from that objectionable jar so common in mine-pumps worked by rotative engines. As regards economy, the compound Cornish type can hold its own against any other form of pump. Take the figures as 15 lb. of steam per indicated horsepower-hour, and the combined efficiency of 80%, then the steam used per horsepower-hour in water lifted equals 18.75 lb. With electric three-throw pumps and steam-generating plant, and a combined efficiency of 50%, in order to equal the Cornish pump the steam engines would require to have a consumption of only 9.37 lb. per indicated horsepower-hour, which I need hardly say is at present impossible under ordinary working conditions. The cost of repairs, labor, oils, and stores is also heavier with the electric pump. The electric turbine pump need not seriously be considered, for unless the water pumped is fairly constant it is far below any of the above types on the score of economy.

W. Percy Gauvain.

Waihi, New Zealand, July 8.

not come amiss. The cement-tester, in stating the fineness and gradation of sizes in sand, has similar data to submit on this point as did Mr. Rotherham. I believe that, while in no sense new or original, the following method has much to recommend it in the way of conciseness and perspicuity. For the sake of definiteness, take the example of the pulp from the battery as given by Mr. Rotherham. Its screen analysis may be conveniently expressed as follows:

$$^{2.53}30\ ^{25.5}60\ ^{4.8}80\ ^{6.1}100\ ^{16.0}200\ ^{45.07}$$

in which the larger figures represent the sieve-numbers, and the smaller upper figures represent the percentages passing and caught upon each sieve, according to whether the latter follows or precedes the sieve-number. This simple scheme gives most of the advantages of a graphical presentation, and entails none of the necessary drawing and reproduction.

H. W. Baker.

San Francisco, September 8.

Homestake Slime-Plant Costs.

The Editor:

Sir—I enclose tabulated and analyzed Homestake slime-plant operating costs for the month of March 1908, which was a typical month. I trust it may prove of interest to your readers.

COSTS PER TON IN SLIME TREATMENT AT HOMESTAKE MINE, SOUTH DAKOTA.

TOTAL TONS TREATED, 49,946.

Item.	Labor.	Electric power and lighting.	Chemicals. Item.	Chemicals. Cost.	Other supplies	Total.
Thickening	$0.00370	.....	.....	.....	$0.00006	$0.00379
Transportation	.....	.....	.....	.....	0.00030	0.00030
Neutralization	0.00625	0.00116	Lime, 4.476 lb.	0.02236	0.00006	0.02985
Filling and discharging Merrill sluicing presses	0.01040	0.00347	.....	.....	0.00239	0.01626
Dissolving and washing	0.02468	0.01502	Cyanide, 0.31 lb.	0.06200	0.00014	
			HCl	0.02324	*0.01000	0.13508
Precipitation (Merrill method)	0.00281	.....	Zinc, 0.127 lb.	0.00762	0.00026	0.01126
					*0.00057	
Heating	0.00218	.....	.....	.....	0.00537	0.00755
Assay office	0.00348	.....	.....	.....	0.00518	0.00866
Superintendence	0.00911	.....	.....	.....	0.00043	0.00954
Miscellaneous	0.01272	.....	.....	.....	0.00117	0.01389
Fire protection	.....	.....	.....	.....	0.00054	0.00054
Refining, bullion expressage, and mint charges	.....	.....	.....	.....	0.00864	0.00864
Total	0.07533	0.01965		0.11524	0.03511	0.24533

*Cloths.

The costs of supplies applying above are as follows: Hydrochloric acid, $4.30 per carboy—10 carboys per press; cyanide, 20c. per lb.; lime, 0.005c. per lb.; zinc, 0.06c. per lb.; labor, $3+ per 8-hr. shift; power, $7.50 per mechanical horsepower per month. One suit of filter-cloths lasts one year; for 24 presses, cloth-consumption is two suits per month, or 1c. per ton of slime treated.

Method of Presenting Screen-Analyses.

The Editor:

Sir—I have read the article by G. H. Rotherham in your issue of September 5, describing the 'Milling Plant of the Montana-Tonopah Mining Company,' and it occurred to me that a suggestion concerning a method of stating the results of sizing-tests might

Two more presses are now being added to the plant, and grading will begin shortly for several more in order to take care of the larger proportion of fine which will result from the operation of the fine-grinding plant now in process of installation.

C. W. Merrill.

San Francisco, August 14.

DREDGING IN THE YUKON.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

(*Continued From Page 293.*)

Apart from economic conditions, which vary all over the world, the distinctive feature of dredging practice on the Yukon is the necessity for overcoming the frozen condition of the ground. This is a geologic frost as distinguished from the seasonal frost; the first is the sequel of a Glacial period, that is, a time when the summer thaw was unable to overtake the winter frost; the second is due merely to winter cold. The seasonal frost, as measured on ground that has been thawed in summer, ranges from 3 to 5 ft., but the geologic frost extends to a depth of 230 ft., if not more, wherever the ground is wet, as in valley-bottoms. On the other hand, the warmth of the short summer, lasting 4 to 4½ months, will thaw the ground to a depth of 4 to 7 ft., according to local conditions, the chief of which is the nature of the surface-covering. In two seasons the frost in a gravel deposit may be conquered by the seasonal thaw to a depth of 10 to 22 feet.

The Northland is covered by a blanket of moss and loam due to the decay of vegetation. This overburden is called 'muck' by the miners because when it melts it runs like thin mud, for it is composed of 25 to 40% organic matter and 60 to 75% ice. When either the summer sun or artificial heat strikes this black blanket, it disintegrates and is readily floated on the running stream. Being a mixture of organic matter and ice, it makes a perfect insulator against heat and protects the underlying frozen ground from the warm air of summer. The thickness of this frozen muck varies from a few inches to 40 ft., the maximum being in gullies where it has accumulated by sliding from adjoining hillsides. Two feet is an average thickness. In summer, it melts; in winter, it freezes solid.

It is obvious that before the seasonal thaw can become effective, the blanket of moss must be removed. This is done naturally by freshets and by meandering streams; it has been done in a general way as an incident in ordinary mining operations along the creeks, and it will be done systematically both by ground-sluicing and also, much more rapidly, by hydraulicking. Where time is not an immediate factor and where bed-rock is not more than 15 ft. deep, a gravel deposit can be thawed to bed-rock in two seasons by simply removing the cover of moss and loam so that the summer heat may get an opportunity to penetrate. But, on the other hand, where dredging operations cannot wait for such a slow method, or bed-rock is deeper than 15 ft., or where old workings exist, it becomes necessary both to accelerate and to perfect the thawing process by the aid of artificial methods. This is done by the application of steam.

By introducing steam into the frozen ground, the ice is melted; the more water (that is, ice) there is in the gravel, the more steam will be consumed in converting water from its solid to its liquid state. Ice is a non-conductor; rock is relatively a good conductor; therefore, the less water the gravel contains, the more easily is it thawed. The stones retain the heat imparted to them so as to radiate it slowly into the surrounding mass. The method of thawing by steam was exemplified on claim 90 Below Discovery on Bonanza creek, just above the No. 6 dredge of the Yukon Gold Co. The boiler-plant consists of two boilers rated at 150, and one rated at 75 hp. These are fired with wood at $8 per cord delivered, the steam-gauge registering a pressure of 150 lb. per sq. in. in the case of the larger boilers, and 100 lb. pressure in the small one. The main pipe-line is 3½ in. diam., and is carried within boxes packed with sawdust as an insulator. All the pipes are wrapped in 'asbestos' covering. The branch pipes approaching the ground to be thawed (at 300 to 400 ft. from the boiler-plant) are 1½ in. diam., also insulated and boxed. At intervals of 8 ft., openings in the pipe connect through nipples with short lengths of hose. This hose is ⅝ in. diam. and 17 ft. long; it must be long enough to reach the heads of the 'steam-points' when they are being swung into position, and to allow latitude in twisting the 'points.' The 'point' is a 'hydraulic' steel pipe ½ to ¾ in. diam., in lengths of 14 to 20 ft. Each hollow rod is provided with steel ends, that is, both the head, which is hammered to drive the point into the ground, and the end penetrating the ground. The point itself, or advancing end, has an orifice $^{5}/_{16}$ in. diam., and through this the steam enters the ground. By the time the steam reaches the place where it escapes into the gravel the pressure has sunk to 25 lb. per sq. in. It must be noted that the pressure at the point is directly dependent upon the number of points, and the aim is to keep it at 25 pounds.

In starting a point it is customary to take a 1¼-in. steel bar and drive it down with an 8-lb. sledge-hammer until frozen ground is struck; then the steam-point itself is introduced, the bar having been withdrawn. The top or head of the point is pounded by one man with a 4-lb. hammer, and at the same time a twist is imparted by a wrench held by another man. This is done at intervals as the ground is softened by thawing, the man in charge proceeding from one 'point' to another in rotation. The rate of thaw is about 2 ft. per hour. If the point refuses to sink, it is allowed to rest for a while, and then if no progress can be made in the usual way, it is inferred that an obstruction, such as a boulder, exists. The steam-pipe is pulled out of the hole with the aid of a lifting-jack and a solid steel bar is introduced; this is then hammered with a sledge so as to penetrate the obstruction or push it aside. If the incompetence of the steam-point is due to the clogging of the orifice through which the steam is emitted this is indicated by condensation at the head, and also by listening for the flow of steam through the hose. The heads of the points are strengthened, so as to receive the blows of a hammer, by a sleeve (or driving-head), fitting the elbow to which the hose is attached. A special clamp is now used instead of the Stillson wrench. I noted that frozen

ground was struck in most cases at 6 ft., this being the depth to which the seasonal thaw had progressed after the moss had been removed.

This method of thawing the frozen ground has been described in some detail as an interesting development of local practice; but it is a temporary procedure. As soon as sufficient water is made available by the completion of a main ditch-system, it is intended to strip the covering of moss by the use of water under high pressure. The ditch and pipe-line of the Yukon Gold Co. is now approaching completion, and the water will be ready for stripping early next season. Thawing will be discarded at the close of next season, except in isolated spots where the water cannot be used advantageously. The method of using water in preparing the ground for dredging will be as follows: First, stock-lines will be laid along the edge of the creek carrying water under high pressure, tapped from the main trunk line. The moss and muck will be stripped by 'piping' (that is, the use of a large volume of water under pressure), driving from both sides to a longitudinal cut, down the centre of the claims. See Fig. 1. This work will be carried forward about two miles ahead of the dredges. When the ground has been stripped, the water will again be applied (at the lower end first), so as to cross-cut the gravel with trenches at intervals of from 20 to 50 ft. The effect of this exposure of faces of gravel to the air is to accelerate the natural thaw. After the cross-trenches have been made, the longitudinal trench will be deepened so as to drain the entire area. The depth of the trenches, and the extent to which this work is carried, will depend upon the depth to bed-rock and the rate of thaw. See Fig. 2 and 3. Experience thus far indicates that when the stripping has been completed, not much trenching is necessary to carry the thaw to bed-rock when the gravel is not more than 18 or 20 ft. deep. Each successive season will extend the thaw farther, so that the depth and amount of trenching will depend upon the nearness of the dredge. By this method, the total cost of preparing the ground for dredging should not exceed 5c. per cu. yd., for there is no installation and maintenance of sluices, and many of the other expenditures incidental to hydraulic mining are lacking. The actual work of mining is done by the dredge; the amount of ground moved in the preliminary operation being small, compared to the yardage dug subsequently by the dredge itself. By thus making the most of the natural thaw, and preparing the ground for rapid dredging, the total cost of mining the gravel should not average more than 20 to 25c. per cu. yd. The result obtained with artificial thawing in advance of dredging actually shows a cost of 19 to 35c. per yd. The more the natural thaw is used to fight the natural frost, the smaller the expense will be, and the less the final cost of operation.

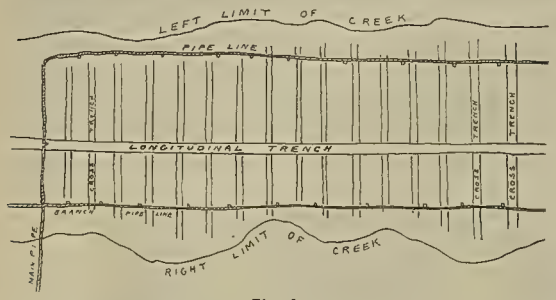
DETAILS OF THAWING APPARATUS.

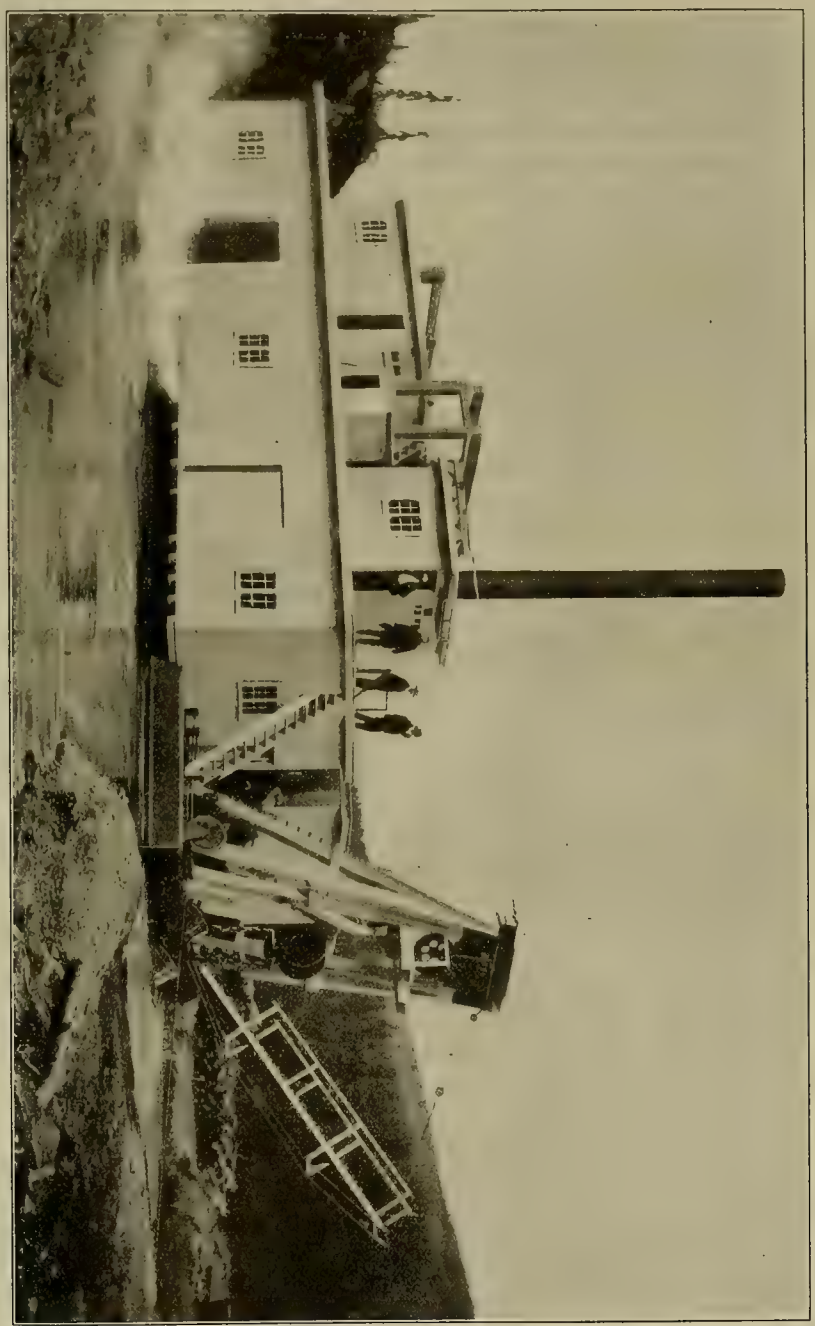
Two bars for making holes, steam-points, and steam-pipe line. The overburden of frozen moss and muck is seen in the foreground.

As a matter of interest, the following data concerning the operations of the No. 6 dredge may be quoted: The width of dredgeable ground, reaching from claim No. 88 Below Discovery on Bonanza creek to No. 104, ranges from 500 to 1300 ft. The depth to bed-rock averages 16.7 ft. The bed-rock itself is sericite-schist, with quartz stringers, decomposed so as to be dredgeable to 4 or 5 ft. deep. The gravel is small; immediately above bed-rock, where the stones are largest, the size is rarely over 6 in., with a few boulders that attain a weight of 100 lb.

apiece. The length of campaign here is one-third of a year, and the dredge is expected to be in service for a period 1½ times as long as in California, that is, the actual working time is one half that of a dredge working at Oroville. Depreciation in the Yukon is based on a service of 12 seasons, equivalent to 5 years of actual operation; in California it is 10 years.

During the 22 days of July that had elapsed up to the date of this writing, the No. 6 dredge had


LEFT LIMIT OF CREEK
PIPE LINE
LONGITUDINAL TRENCH
CROSS TRENCH
CROSS TRENCH
CROSS



Five-Foot Steam Dredge, Forty Mile Creek, Alaska: Digs 20 Feet, Stacks 20 Feet, with Capacity of 60,000 Cubic Yards per Month.

Built in 1907 by the Risdon Co.

ASSOCIATION OF MAGNETITE WITH SULPHIDES IN MINERAL DEPOSITS.

Written for the MINING AND SCIENTIFIC PRESS
By JOHN B. HASTINGS.

(*Continued From Page 334.*)

W. H. Emmons,[8] describing the Cable mine, Montana, says: "The orebodies of the Cable mine are . . . replacement deposits of contact-metamorphic origin. . . . They cannot be classed as replacement veins or stocks, for their boundaries are approximately cylindrical or rudely spherical, and a single orebody does not extend very far in any one direction. . . . Magnetite is present throughout the ore-zone as large irregular bodies that have apparently no relation to the bedding-planes of the rocks. These bodies are confined to the limestone, and occur on all levels. The magnetite bodies are rudely ellipsoidal in outline, and some of them are at least 100 ft. diam. . . . The ore deposits are large irregular bodies of calcite and quartz, containing a large amount of mixed iron and copper sulphides and iron oxides. These are confined to a long narrow zone of limestone and calcareous shale that trends southeastward and is bounded by two granite intrusives, the walls of which are steeply inclined, nearly parallel, and from 80 to 360 ft. apart. . . . The original metallic minerals are pyrite, chalcopyrite, pyrrhotite, arsenopyrite, magnetite, specularite, and gold. . . . In most of the ore of the lower levels calcite, quartz, pyrite, and chalcopyrite are interlocking irregular bodies, which apparently were deposited at one time. When a magnet is passed over the crushed ore, there is nearly always a separation of magnetite and pyrrhotite. . . . The primary ore minerals are pyrite, pyrrhotite, chalcopyrite, magnetite, and specularite, and these are all characteristic of contact-metamorphic deposits. The earthy minerals also characteristic of contact-metamorphic deposits and present in the ore-zone are amphibole, calcite, garnet, mica, and epidote. Calcite is the only one of these which is intimately associated with or is a part of the ore." The mica occurs in fault-planes, and is younger than the magnetite.

About Cable mountain are similar deposits in limestone near the granite contact, and these replacement-deposits, in contra-distinction to those just described, are clearly related to fissures. "Much of the magnetite carries from 20 to 80c. per ton in gold, and at some places it has been prospected with the hope that in depth it will change to a sulphide ore carrying gold in payable grade. The large bodies of magnetite, however, are unquestionably of primary origin, and will continue to be magnetite as far down as they extend. The pyrite ore of the veins alters to limonite and hematite, carrying small grains of magnetite, and nowhere to large masses of magnetite. The presence of the small magnetite grains in the oxidized ore has no diagnostic value, for they are present in the oxidized ore of practically every ore deposit in the Philipsburg area, and a large number of these are ordinary fissure-veins, and in no sense replacement deposits."

The following are three examples of allied occurrence of magnetite in the East. W. Lindgren,[9] writing of the gold deposits of Dahlonega, Georgia, describes the enclosing rock as mica-schist and amphibolite, both thoroughly re-crystallized by hydrochemical and dynamo-metamorphic action. He says: "Magnetite is present in elongated masses, in places intergrown with pyrite and chalcopyrite. There is no pyrite, but a considerable amount of pyrrhotite, usually intergrown with smaller grains of chalcopyrite." The veins are described as of similar type to those of California and Australia, derived from solfataric waters, following fissures usually corresponding with the foliation of the mica-schist. It seems to be uncertain how much of the magnetite was introduced by these waters, as the magnetite of the wall-rock and some of the veins is seen to antedate the latter, and to have remained stable during their formation.

L. C. Graton, on the gold and tin deposits of the southern Appalachians, says: "Magnetite occurs in the wall-rock of a quartz vein at the Jones tin mine, and has undoubtedly been formed by the vein-solutions." These solutions deposited gold, pyrite, pyrrhotite, chalcopyrite, and other minerals.

Of the magnetite deposits described above, only those seen by Brooks were thought to be surface oxidation products, in which the magnetite was a secondary mineral. Kemp thought the magnetite in Mexico primary, but deposited earlier than the sulphides which impregnated it. Lindgren, Spencer, Brock, Graton, S. F. Emmons, and W. H. Emmons, in the respective deposits examined, also all thought the magnetite primary and contemporaneous with more or less of the sulphide, and finally all the authors are agreed that the iron is a foreign constituent, brought up from depth, presumably an emanation from cooling magmas, and as nearly as I can interpret their decision, they think the vehicle of transportation was water. It may have started as a vapor, but probably the resistance to its passage in the poorly defined channels described would so impede it as to allow of condensation. It not only had to convey the ore materials to their present position, but to take up and continue on with the matter replaced.

There should not be any surprise at finding magnetite when its original source is held to be an eruptive magma, as almost any piece of the crystalline rock, even small enough to be microscopically examined, contains magnetite. If there be astonishment, it is perhaps because the iron in precious metal deposits is usually a sulphide. We are apt to think of vulcanism as giving off great quantities of sulphur, and so it does to a certain extent, and in certain places, but it is small when compared with oxygen. This is shown by the constituents of the extruded rocks, which are all oxides. We might think that the sulphur would be driven off by the excessive heat, and not form chemical combinations, but this force is balanced by pressure. It is expelled to some extent as

[8] "The Granite-Bimetallic and Cable Mines, Philipsburg Triangle, Montana." U. S. G. S., Bull. No. 315.

[9] "Gold Deposits of Dahlonega, Georgia." U. S. G. S., Bull. No. 293.

sulphurreted hydrogen and sublimates in free vents, and it is also carried away by the escaping vapors of magmas with the same selective affinity they exhibit for the metals and other metalloids. Its presence in the magma is sometimes shown by the formation of iron sulphides, which have been found to occur quite often as an original constituent of eruptives.

With the presence of an excess of water in magmas or subterranean channels the hydrated iron oxide, instead of the anhydrous, might be expected to form. Van Hise thinks pressure has to do with the result. Magnetite is one of the first minerals to solidify in a magma, but it is not always resistant to vaporous solutions, as shown by Lindgren at Dahlonega. The same author found it unstable in California in the presence of other ascending vein-waters, so it is but natural that it should be re-dissolved and carried off from the magmas by the solutions. It is significant, in view of their easy solidification, that these iron oxides are absent from the later and cooler stages of solfatarism, and quite common in typical contact-deposits formed by pneumatolytic action. As such vapors carrying sulphur attack the biotite and magnetite of the country passed through, and form sulphides at their expense, it suggests that, given the necessary amount of sulphur, pyrite instead of magnetite would be formed. If there is a lack of sulphur in the ascending solutions, however, copper will apparently first supply itself, then pyrrhotite (Fe_7S_8) will form, instead of pyrite (FeS_2), and when the sulphur is used up, magnetite must form. As illustrative of the lack of sulphur, the native iron in the basalts of Ovifak, Greenland, is possibly a case in point. There iron alloyed with nickel and cobalt has resisted oxidation in its solidification so that it survives as particles of native metal alongside of crystals of magnetite, and both are distributed with the other constituents of the basalt—feldspar, augite, and olivine. As is well known, the iron has also concentrated into quite large masses at the same place, and when first discovered by Nordenskiöld in 1870 they were thought to be ordinary meteorites, but this being disproved(?), they have since been sometimes thought original fragments from the dense central mass of the earth.

Magmas need to be regarded as solutions with all the potentialities of chemical combinations, so much so that as fast as minerals solidify they are shoved to one side, into the cooler part. This is the law of differentiation, as discovered by Sorby; and in effect, as the more basic minerals solidify first, plutonics, like slowly cooling slags, are more acid in the interior of their masses. This is well put by J. P. Iddings[10]: "The minerals which crystallize in a rock magma result from the chemical affinities inherent in a complex solution of silica, alumina, alkaline earths, and alkalis, including iron, lime, magnesia, potash, and soda, between the various demands of which there must be a mutual accommodation. Hence it is evident that the component minerals of a given rock must be those which, under the conditions attending their crystallization, satisfy all the chemical demands imposed by those conditions." These remarks are equally applicable to the magmatic waters. Probably the greatest differentiation of magnetite known on the continent is at Iron mountain, Wyoming, lately described by S. H. Ball. This immense deposit of titaniferous magnetite was discovered in 1850 by H. Stansbury, and has been described by Hayden, King, Kemp, and others.[11] It is a true iron dike, 1¼ miles long and 40 to 300 ft. wide, with an average width of perhaps 175 ft., cutting anorthosite. The contact between this enclosing rock and the ore-dike is sharp where exposed, "neither rock having undergone important gradational changes. . . . The iron ore is a black, granular, holo-crystalline igneous rock, with constituent grains varying from ⅛ to ½ in. diam. . . . It has a metallic or sub-metallic lustre. Changes in granularity occur in irregular masses or along well defined parallel planes. In consequence of this distribution the rock has at some places an original gneissic structure. The greater portion of the iron is free from mechanical impurities, but biotite, olivine, and feldspar are sporadically distributed throughout its mass. . . . The iron content is fairly high, averaging about 50%, and the most noticeable feature of the ore is its high titanium content. . . . The iron ore and the anorthosite are differentiation products of a common magma, the iron ore having been intruded into the anorthosite after that rock had completely solidified." The sulphur content averaged 0.033% in three analyses, and 1.29% in two others. This means a concentration of about eight into one, from the original gabbros.

COKE-MAKING IN WASHINGTON.

Washington is the only one of the Pacific Coast States in which coking coals are known to occur, according to E. W. Parker, chief statistician of the U. S. Geological Survey. When compared with those of some of the Eastern States, the coking operations in Washington seem of small importance, but they are of interest as establishing the fact of the possibility of making metallurgical coke from Pacific Coast coal. All the coking operations are in Pierce county, in the central part of the State. There are five establishments, four of which made coke in 1907, producing 52,028 tons, valued at $293,019, against 45,642 short tons, valued at $266,977 in 1906. The average price per ton advanced from $4.99 in 1906 to $5.63 in 1907. All of the coal used in coke-making in Washington in 1907 amounting to 85,860 short tons, was washed. Three of the plants used washed run-of-mine coal and one used washed slack.

The Lash steel process, in which finely divided ore is intimately mixed with carbon, a certain quantity of finely divided carboniferous iron, sawdust, and suitable fluxes, and the whole treated in an open-hearth furnace in a bath of molten metal, is one of the most recent inventions. It is claimed that in using the Lash mixture in an electric furnace no bath of pig-iron is necessary, and a yield of 98% of the metallic content of the mixture is recovered.

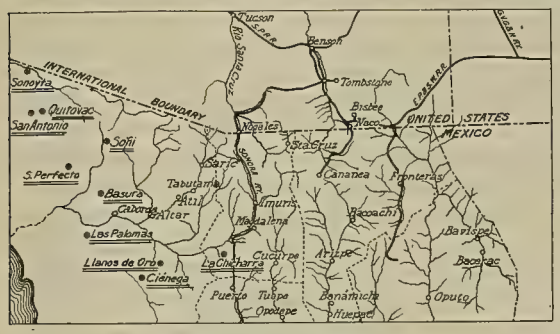
[10] 'Volcanic Rocks from the Tewan Mountains.' U. S. G. S., Bull. No. 66.

[11] 'Titaniferous Iron Ore of Iron Mountain, Wyoming.' U. S. G. S., Bull. No. 315, pp. 206-212.

DRY PLACERS OF NORTHERN SONORA.

Written for the MINING AND SCIENTIFIC PRESS
By F. J. H. MERRILL.

From the early days of the Spanish occupation Sonora has been one of the chief gold-producing districts in the Mexican Republic, and there is every reason to believe that a part of the Aztec treasures of this precious metal came from this State. Gold-bearing veins are abundant in its westernmost district, which was named Altar from the Jesuit mission of Santa Guadalupe del Altar, founded in the latter part of the seventeenth century. From the superficial decay of these veins came a series of extensive placer-deposits, in which the gold was concentrated by rain-wash in channels, or *corrientes*, now buried below the surface, which have proved to be more important sources of this metal than the

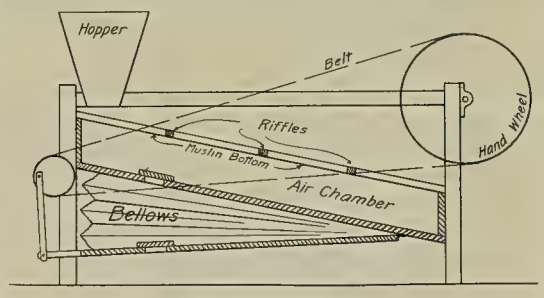


Northern Sonora, Mexico.
Underscored names indicate dry placers.

veins in this region which have thus far been worked, for the placers represent the concentrated values of hundreds of feet of vein-matter, and therefore a tonnage far beyond the production of any or all of the mines thus far operated in the Altar district. As in many other parts of the southwest, there being no supply of water available at low cost for washing the gravel, the deposits are known as 'dry-placers.' These formations occur at other points in Sonora, but have not attained as great an extent or developed as much commercial importance as in the district of Altar. At most places where these deposits occur they consist of two divisions, an upper member of loose material, and a lower member of cemented gravel. The superficial material, being easier to work, has been the object of the earlier operations, and in most of the placer fields has been quite vigorously exploited by primitive methods. The lower member, being a gravel cemented with calcareous matter, has generally been left unexplored until within the last three or four years, when, chiefly by American enterprise, shafts have been sunk in it to a depth of 100 to 150 ft., and the gold has been successfully extracted from the richer gravel of the 'channels' in which the ancient streams concentrated the metal. The superficial loose-gravel is worked by two methods. The more primitive is by the *batea*, or wooden gold-pan. In this, the gold-bearing dirt is placed, and by skillful whirling, and a blast of air from the lungs, the lighter material is winnowed out, leaving the gold and a heavy black-sand, which is further cleaned by the use of a magnet and by careful manipulation.

A more commercial method is by the use of the Hungarian 'dry-washer,' a machine introduced from Europe about 1851. This consists of an inclined table placed over a bellows which is driven by a belt from a wheel turned by hand. The table is a wooden frame, crossed by riffles, and with muslin stretched on its under surface. Through this muslin passes the intermittent blast of air, and the dirt, falling from a hopper at the head of the table, which slopes about 15° from the horizontal, passes gradually down the incline, aided by the periodic shock of the bellows-stroke, the light dust and sand being blown upward and over the successive riffles. As the operation continues, the bulk of the material falls to the ground over the lower end of the table, while the gold, and a small part of the other heavy particles, are retained behind the riffles. These concentrates are then further cleaned in the *batea*, or the gold is taken out with mercury. In material of moderate richness the gold is all caught behind the first riffle; in richer material, some of it may be found behind the second or third riffles. In skillful hands the machine effects an almost complete extraction of the gold, both fine and coarse. A machine of average size, worked by two men, has a capacity of 15 to 20 tons per day. The cemented gravels must be broken up before treatment by these methods, but this can often be accomplished by exposure to the sun and air, which effects a decomposition of the cementing material. Crushing by stamps or similar machinery is not economical, because it involves crushing the pebbles, which rarely contain appreciable assay values.

Llanos de Oro was recently the scene of an extravagant placer-mining operation in which a Los Angeles company under ill-advised management spent large sums of money on a stamp-mill and other equipment, entirely unsuited to the needs of the



Hungarian Dry Washer.

property. Some small interests operating in a conservative way are at present recovering gold economically from the cemented gravel in deep shafts near the Llanos de Oro. At the Chicharra placer, west of Llano station in the Magdalena district, attention has been given of late to the treatment of the loose gravel on a large scale by dry concentrators driven by gasoline power. A number of patented machines have been devised for this work, but many of them have been planned for treating crushed vein-matter rather than placer-gravel; and usually require the material to be reduced to 20 or 30 mesh. This is not practicable with the placer-

gravel of the region under discussion, for it carries much coarse gold, which will not stand screening finer than ⅛-in. mesh without loss of the precious metal.

A machine to be successful must therefore separate gold in nuggets up to ⅛ in. as well as gold so fine that it would float on water. The accompanying map shows the position of the principal placer-fields in Altar. Others are known near the coast, and in the Magdalena, Arizpe, and other districts, but those have not much commercial importance. That of La Ciénega, discovered in 1799, and long a source of gold extracted by the *batea*, was made the scene of extensive operations from 1884 to 1894 by members of the Serna family, and others, who employed a large number of Indian laborers—10,000, it is said—to work the loose gravel with the Hungarian dry-washing machines. The total amount recovered was unquestionably great, although exact figures are lacking. There is a large amount of gold at present locked up in these placers which will, in time, be recovered by intelligent and economical methods of operation. But here, as elsewhere, it has been too often the case that the man employed to superintend the development and exploitation of a property has fortified himself with the dubious axiom which one so often hears from the representatives of mining companies that "a mine is no good that requires careful management." The chief difficulty in the working of these deposits is the variable distribution of gold. The rich bottom-layer of a *corriente* or channel may, in a depth or thickness of 8 to 12 in., carry as high as 2 to 2½ oz. gold per ton. This gold-content is, however, not always continuous, and when the limit of a rich bed is reached, its continuation must be sought in the vicinity by diligent exploration. The barren interval, is, however, rarely very great. Above the rich bottom-layer the gold-content is variable, and may fall to 50c. per ton or lower. At this value the surface gravels may be worked profitably. There is, in my judgment, no question that, in the near future, these deposits will yield a good return to men of thorough technical training and experience in economical management.

The standard for the determination of silicon in iron, adopted by the American Foundrymen's Association, is as follows: Weigh 1 gm. of the sample, add 30 c.c. HNO_3 (1.13 sp. gr.), then 5 c.c. H_2SO_4 (conc.). Evaporate on a hot plate until all fumes are driven off. Take up in water and boil until all ferrous sulphate is dissolved. Filter on an ashless filter, with or without suction-pump, using a cone. Wash once with hot water, once with HCl, and three or four times with hot water. Ignite, weigh, and evaporate with a few drops of sulphuric acid and 4 or 5 c.c. of hydrofluoric acid. Ignite slowly and weigh. Multiply the difference in weight by 0.4702, which equals the per cent of silicon.

The exports of British-made mining machinery to South Africa during the last three years have been as follows: in 1905 the total value was £279,208; in 1906, £246,604; and in 1907, £250,055.

A PERUVIAN LEAD SMELTER.

Written for the MINING AND SCIENTIFIC PRESS
By LESTER W. STRAUSS.

The following notes, taken in June 1907, refer to the only lead smelter in Peru shipping argentiferous-lead bars. The smelter is at Vesubio, on the eastern side of the Cordillera Blanco of the Andes, in the department of Ancachs, at an altitude of 14,000 ft. above sea-level; the climate is somewhat rainy and snowy, but not excessively cold. It is distant from the coast about 135 miles by trail, which is covered in three days' riding; the road from Port Casma to Huaráz is fairly good, but from Huaráz to Vesubio it is very rough. The highest point crossed is 15,000 ft. above sea-level and usually covered with snow and ice.

The ores treated are a mixture of galena, zinc-blende, pyrite, chalcopyrite, and tetrahedrite, in a quartz gangue, supplied by four mines distant 1¼ to 6 miles from the smelter. The ore is sorted at the mines. The assays vary from 5 to 36% lead; 23 to 110 oz. silver; a trace to 0.5% copper; 6 to 20% zinc, and 0.5 to 3% antimony. The ore is

Smelting Works at Vesubio, Peru.

weighed as received, and is then screened through a suspended 8-mesh screen. The coarser ore is ground in two arrastre mills, being a combination of a grindstone 4¼ ft. diam., with 1⅓-ft. grinding face, a dragstone 3¼ ft. long, 1¼ by 1¼ ft. in cross-section. These are driven from a vertical shaft direct connected to a horizontal water-wheel. The two mills grind about 6½ tons per 24 hr. The ore contains from 2 to 3% moisture. Three men attend to the screening, while two feed the mills. The fine ore is shoveled into a 1½-ton charge-car, and trammed about 40 ft. to above the hopper of the reverberatory roasters. The two-hand reverberatories, when both are running, roast about 9 tons per 24 hr. The larger one only is usually at work, handling 6 tons per 24 hr. It is 57 ft. long and 10.8 ft. wide, being divided into 3 hearths and a fire-place (3 ft. wide). Wood is used as fuel. This is delivered for 30 cv. per quintal, about 22 quintals being consumed each 24 hr. It takes 6 hours to work a charge of about 1½ tons. A little lime is mixed with the ore when dropped upon the hearth. The mass is gradually moved forward toward the fire-box, the men rabbling from both sides. Here it is allowed to sinter and agglomerate. Should this process be slow, some old litharge, from the cupelling furnace, or iron-oxide ore con-

taining 20 to 25 oz. silver and 5% lead, is added. The finished product is drawn out onto the furnace floor, and the black compact mass is broken into small lumps. The ore, as charged to the reverberatory, contains about 20% sulphur, and the roasted ore about 7%. To attempt too close a desulphurization would mean an increase of lead and silver volatilization; some sulphur is necessary to take up the copper and form matte and prevent the gathering of incrustations in the lead-well. The silver and lead losses due to volatilization are probably 3 to 5% for the former, and 15 to 20% for the latter. The effect of roasting, in desulphurizing and volatilizing the lead, zinc, antimony, and silver, is to increase the lead and silver content of the ore smelted. The loss in weight due to roasting is about 25 to 30%. The process takes 12 men per 24 hours.

The roasted ore is carried up to the feed floor and dropped close to the furnace. The furnace is of circular type, being 1 metre in diameter at the zone of fusion, and 3.5 metres from the tuyeres to the charging floor. The tuyeres are 12 centimetres in diameter, the waterjackets 60 centimetres high, the remainder being brick-work made of local materials. Iron hoops placed 0.5 metre apart pass around the outside. The crucible is 20 centimetres deep and 1 metre in diameter. All the iron-work of the furnace is made in L[illegible], as well as the slag-pots, and accessories. The blast is delivered from a No. 3 Green blower, in a galvanized iron pipe, which distributes through a 20 by 22 centimetre air-box to the tuyeres. The air-pressure is about 12 oz. The top of the furnace is bricked over. A dust-flue leads off just above the feed floor to the flue from the reverberatories, being 80 centimetres square in cross-section. This connects with the stack, 8 metres high and 80 centimetres square in cross-section, which discharges 40 metres above the charging floor. The plant is operated by water-power. About 30 hp. are available, which are used for the Green blower and for a small dynamo furnishing light for the plant and quarters. The water-wheel is 4 metres high and 0.5 metre wide, made of the local wood 'quinual.'

The furnace charges are usually made up on a basis of 225 lb. of roasted ore. The coal, iron-ore, and foul slag are conveniently close to the scales. The iron-ore, which is limonite, is obtained 6 miles from the smelter, and is delivered to the charging floor for 5.20 soles per ton (1 sol being worth a trifle less than 50c. gold). It contains 75 to 80% Fe_2O, 2.5 to 3% SiO_2, and assays 1 oz. silver. A clay deposit, distant 14 miles, supplies the necessary material for the bricks used in the reverberatory and blast-furnaces. Sand and kaolin are found close to the plant. The bricks for lining the lower exposed wall of the furnace are brought from the coast, and cost 40 centavos each. Little or no lime is used as flux in the furnace, there being sufficient in the gangue combined with that used in the reverberatory. The limestone is brought about 5 miles at a cost of 5 soles per ton. Its composition is CaO, 51.5%; CO_2, 40.5%; Fe_2O_3, 3.4%; SiO_2, 4.5%. Coal of a semi-anthracitic variety is mined about 25 miles from the smelter, and costs, delivered at the bins, 17 soles per ton. Its composition is, volatile matter, 12.3%; fixed carbon, 85.4%; ash, 2.3%. Its specific gravity is about 1.7, and it yields about 6400 calories (Berthier). The coal is compact and clean and has little or no sulphur. The average assay of the ore, prior to sorting, is about: lead, 16%, copper, 0.20; zinc, 15; antimony, 2; sulphur, 20; iron, 15; silica, 20; silver, 65 oz.; and gold, 0.09 oz. The foul slag forms an important part of the charge. A partial analysis shows, lead, 3.5%; copper, 0.3; iron, 30.8; silica, 33.3; and silver, 12 ounces.

The following are the percentages and weights of fluxes charged on the basis of 225 lb. of roasted ore:

	%	Lb.
Roasted ore	44.1	225
Iron ore	4.9	25
Lead scrap	2.0	10
Foul slag	49.0	250
	100.0	510

The coal charged is slightly less than 15% of the ore and flux, its weight being 75 lb. The number of charges smelted, per shift of 12 hr., varies with the running of the furnace, the minimum being 40 and the maximum 70, equivalent to 9 to 16 tons per 24 hr. The furnace smelts on an average 12 tons of roasted ore equal to 16 tons of raw ore; a total of about 27 tons of raw ore and flux being put through per 24 hours.

The slag is tapped 10 to 12 times per hour, passing from the furnace to a settler, and then to the slag-pots. Slag samples are taken as the slag flows from the settler to the pot. Daily assays are not made, the running of the furnace being judged by its physical condition, and by the specific gravity of the slag, which should be 3.8. If higher it is judged that there is too much iron, and is causing loss of lead in the slag. The slag is allowed to stand about 5 minutes in the pot and is then poured. The foul slag-shell is dumped on the ground to be broken and fed to the furnace. Sometimes the slag is poured into molds, 12 in. long and 6 in. square in cross-section, to be used as building brick. These are very strong and serviceable. The slag analysis is approximately, SiO_2, 30.9%; FeO, 42.3; CaO, 7; ZnO, 9; Pb, 2.5; Cu, 0.1; and 6 oz. silver.

The furnace losses are silver 10 to 12%; lead, 20 to 25%, and copper 25%. These high losses are due to running with a 'hot top,' and to other poor furnace manipulations.

The flue-dust caught does not amount to much in weight. It assays from 26 to 30 oz. silver. Systematic sampling of the raw ore, roasted ore, foul-slag and slag are rarely attempted, only the bullion samples being regularly assayed, together with samples sent in from the mines. The slag issuing from the furnace falls on a bed of fine coal in the settler. The coal helps to reduce the lead, which is tapped once every 24 hr., yielding on an average 650 lb., or 8 bars.

The lead-well is tapped two or three times per shift, that is, 12 hours, depending on the quantity of lead in the crucible, which holds about 2000 lb., or 24 bars. It yields on an average 2700 lb., or 32 bars of lead per 24 hr. The molds are placed on a scale

near by and roughly weighed to 37 kg.; every seventh bar is set aside to be sampled. The average assay of 8072 bars shipped, is lead, 89%; silver, 698 oz. (2.39%); gold, 0.95 oz.; copper, 3%; and antimony, 3.5. The degree of concentration is about 12 tons of raw ore to 1 ton of bars. The lead-bars are trimmed up, each weighed, and the weight, in kilograms, and the lot-letter stamped on the top of the bar. Two to three bars can be loaded on a burro to be packed to the coast at Port Casma. The journey takes 6 to 8 days, and costs 2.70 soles per bar. There the bars are loaded on a coasting steamer for shipment to Europe. Formerly the lead-bars were cupelled at the smelter, and only silver bullion was shipped. The furnace campaign is usually from 10 to 14 days per month, about 18 men being employed per 24 hr., including foremen, feeders, scalemen, tappers, slag-pot men, foul slag breakers, and roustabouts.

Native 'cholo' labor is fairly abundant. Wages

Smelter at Vesubio, Peru.

vary from 40 centavos to 1 sol per day of 12 hours.

Cost-keeping is not seriously practised, nor is information concerning costs willingly divulged. The following figures are based on a run of 16 tons of raw ore per day, figuring back from a lot of 800 tons of raw ore which produced 1596 lead bars. The silver is paid for on assay-value, less 4 centavos per ounce. Lead is paid for on assay-value, as likewise are the gold, antimony, and copper. All money values are in Peruvian currency, 10 soles or one pound sterling being equivalent to $4.85 U. S. currency. All tonnages are on the basis of 2000 pounds.

FUEL AND FLUXES.	Soles.	Soles per ton.
4 tons coal at 17 soles	68.00	4.25
1/3 ton iron ore at 5.20 soles	6.93	0.43
	74.93	4.68

LABOR.	Soles.	Soles per ton.
2 tappers at 1 sole	2.00	0.125
4 chargers at 80 centavos	3.20	0.20
4 slagmen at 60 centavos	2.40	0.15
4 slag-breakers at 55 centavos	2.20	0.138
4 roustabouts at 50 centavos	2.00	0.125
Foremen, blacksmiths, carpenters	16.00	1.00
Repairs, power, etc	32.00	2.00
Assaying, etc.	8.00	0.50
	67.80	4.24

SUMMARY. (16 tons smelted per 24 hours.)		
Administration, superintendendence, and general costs	80.00	5.00
Freight to Port Casma.....per bar	2.70	5.39
Commission to agents at Port Casma .....per bar	0.05	0.10
Pier charges and loading bars aboard steamer.....per 100 kg	0.30	0.23
Charges for stamps, taxes, and watchman (from data for 10 lots)		0.05
Freight to Swansea (rate at present time, June, 1908, is lower)..... .....per 2240 lb.	31.25	2.39
Freight from mines to smelter		4.36
Crushing ore		0.50
Roasting ore		3.00
Smelting ore—Fluxes and fuel		4.68
Labor, repairs, power, etc		4.24
Administration, etc.		5.00
Freight on bars to Port Casma		5.39
Port Casma shipping charges		0.38
Freight to Europe		2.39
Commissions and Insurance		1.00
Refining charges		1.75
Total		32.69

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

L. L. B., San Diego county, Cal.: gold ore; quartz with limonite containing free gold; traces of sulphides remaining.

F. W., W. Vernon, Nev.: No. 1, rock now composed of silica, representing probably an original fissure-wall replaced by quartz; pyrite and secondary magnesian silicates occur; No. 2, tuff, partly decomposed; No. 3, metamorphic shale.

J. M., Dillon, Mont.: No. 1, fine-grained feldspar porphyry with disseminated pyrite; No. 2, pyrite (iron sulphide) in quartz; there are no evidences of platinum, but assays may show gold; No. 3, black sand, chiefly ilmenite (iron-titanium oxide); there was no platinum or gold in the sample; No. 4, pyrite in white sandstone; no platinum.

B. A. P., Grass Valley, Cal.: No. 1, fine-grained augite andesite; No. 2, fine-grained schist with pyrite seams; No. 3, decomposed schistose rock too badly altered to be identified; looks like altered modification of No. 4; contains some sulphide; No. 4, basic schist, probably a metamorphosed tuff; seamed with pyrite.

BLAST-FURNACE GASES IN SILVER-LEAD SMELTING.

By T. S. Austin.

Edited for the Mining and Scientific Press
By L. S. Austin.

Tests were begun in April 1893 at the Gran Fundicion Nacional Mexicana, Monterrey, Mexico, to see if practical data could be derived for use in controlling fuel-consumption. At first only the volume-ratio between the CO and the CO_2 in the furnace gases was determined. Later the absolute weight-ratios of these two gases were taken, but afterward the volume-ratio was computed to a weight-ratio, making no correction for temperature and pressure.

Analyses of Silver-Lead Blast-Furnace Gases.

SERIES A.

Date.	By Volume CO %	CO_2 %	Pb. in Slag %	Condition of Furnace.
Mar. 31....	7.1	18.8	1.0	Running fast.
Apr. 1....	9.5	14.3	0.4	Speed slow, furnace tight, rather down.
" 1....	4.9	22.3	0.6	Speed fast, furnace full, loose and free, smoke clean.
" 3....	10.4	21.0	0.2	Medium speed.
" 3....	7.7	17.6	0.7	Furnace low, running slowly.
" 3....	5.0	21.1	0.7	Furnace full, gases taken against wall.
" 3....	6.6	19.2	0.7	Furnace full, gases taken at middle of furnace.
" 4....	3.9	22.2	0.5	Very slow; 35 lb. charcoal on charge; lead high later.
" 4....	6.6	19.4	0.4	Speed fair, but not fast; charcoal on charge, 35 lb.
" 6....	6.5	23.0	0.7	Speed good.
" 6....	2.4	24.5	0.8	Speed slow.
" 6....	7.2	18.0	0.4	Running slowly.

SERIES B.

May 16....	20.3	9.5		Furnace full, sample taken 2 ft. below surface (red heat).
....	9.0	19.7		Furnace full, sample taken at surface of charge.
" 16....	19.2	18.2		Sample taken 2½ ft. below surface.
....	8.8	19.8		Sample taken at surface.
" 16....	10.4	16.8		Sample taken 3 ft. below surface.
....	9.8	17.6		Sample taken at surface.
" 16....	8.3	17.0		Sample taken 6 ft. below surface.
....	2.7	21.8		Sample taken at surface.
June 5....	6.9	20.5		Sample taken 3½ ft. below surface (just red).
....	4.6	23.6		Sample taken at surface; speed high.

The first series, extending over two weeks, was tabulated so as to show, as closely as possible, the three important factors in furnace-working, namely, speed, reduction as given by lead-assay and fuel-consumption. Thus arranged, the hope was to find whether the ratios of CO to CO_2 would indicate a favorable or unfavorable state of affairs in any of these particulars. It would be a fair assumption that if the CO_2 was very high, compared to the CO, an economical use of the fuel was being obtained. If, at the same time, the lead in the slag were reasonably low, and the furnace-speed sufficiently rapid, the inference would be a low consumption of fuel with smelting-conditions very favorable. If, however, this low ratio CO/CO_2 should be accompanied by:

(1) High speed, with a slag high in lead, the amount of fuel used would seem to be insufficient.

(2) With high lead and low speed the amount of fuel would also be deemed insufficient.

(3) With low lead and low speed the amount of fuel would be in excess of requirements for good work.

In another condition of the furnace, with the ratio of CO to CO_2 nearer unity, two cases might be presented:

(1) If the slag were low in lead, and the speed rapid, the indications would be that too much fuel was being consumed.

(2) If the slag were low, and the speed low, a like inference would be drawn.

Again, with the ratio of CO to CO_2 high, and with the slag also high, while the furnace was smelting at low speed, a solution of the difficulty could not be reached through adjustment of the amount of fuel used, but through changes of a mechanical nature, such as alteration in the fineness of the ore, or correction of error in charging, or possibly in re-calculation of the slag-composition. This latter, however, cannot be considered a serious factor, as any metallurgist should be able to figure a charge and produce a slag suited to his ores.

Dividing our comparisons, then, into three heads, as regards the furnace, namely, speed, lead in the slag, and fuel consumption, the aim would be to correlate results with reference to a CO to CO_2 ratio.

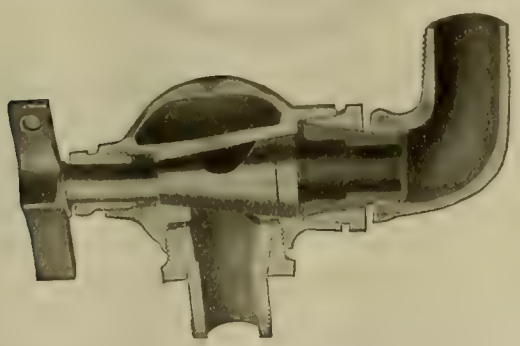
Referring now to Series B of the table, the pairs of analyses taken, one at the surface and one at a distance below it, indicate that the CO has accomplished its duty in reduction. We may figure the velocity of the escaping gases through the charge at 5 ft. per second, both in the iron and in silver-lead blast-furnaces. Hence, a given portion of gas acts in the latter case but for a single second before it emerges at the top of the charge, in this brief period passing from about 600° C. (a low red heat) to a temperature of perhaps 120° C., and causing a change in the percentage of CO_2 and of CO, the former increasing at the expense of the latter. In the iron blast-furnaces the gases 30 ft. down, at the beginning of the zone of reduction, contain about 34.5% of CO and 65.5% of nitrogen. At the tunnel-head they may carry CO 24, CO_2 16, and N 60%. Thus, in iron furnaces, the CO, on acount of its greater concentration, is a more efficient reducer than in the case of silver-lead blast-furnace gases. These latter have, however, only to reduce the iron to the ferrous state.

Arsine in the air is usually detected by utilizing the reaction with $HgCl_2$ when a paper wetted with such solution is exposed to AsH_3. But various other gases which possibly might be present may give a yellow tint which simulates that produced by AsH_3. It has been noted that passing the air through a solution of Cu_2Cl_2 will remove those interfering substances, and that if the air so purified is then passed through a U tube containing a slip of paper moistened with $HgCl_2$, the paper will not show a yellow tint unless AsH_3 is present.

Air-Drill Lubrication.

Written for the Mining and Scientific Press
By Thos. J. Barbre.

I have become much impressed with the results obtained by an ingenius and effective combination of a valve and lubricating device for air-drills, manufactured by The Western Lubricating Valve Co., of Denver, Colorado, and believe that a wider acquaintance with it will lead to good results in several ways. Of all the machinery in use around a mine none is expected to render more service and none to receive as much abuse as rock-drilling machines. The superintendent of any large mine would not think of running his hoisting engine, or any piece of mechanism, without some efficient lubricator attached to it, yet he will send his rock-drills down into the mine to be used in the dirt and



dust without any means of properly lubricating them, and then wonder why the repair-bills are so heavy and why the machines do not last longer.

The present practice of oiling rock-drills throughout the country is as crude as it was thirty years ago, that is, the miner goes down into the mine, at the beginning of the shift, and if he remembers it he pours a canful of oil into the machine to 'oil' it, but he more effectively oils the stope, because the oil is blown out of the machine with the first few strokes, and from then until noon the machine is supposed to be properly lubricated. At noon, if the miner thinks of it, he gives the machine another 'dose' of oil, and again oils the stope, and the machine is supposed to be oiled for the rest of the shift. Very often the miner forgets, or neglects, to oil the machine more than once a day, and I have worked in the mines beside men who did not oil their machines at all for more than one day in succession.

It can readily be seen that this process of 'oiling the stope,' rather than oiling the machine, has a greater effect on the ultimate results of mining operations than is apparent at first thought. In quartz-mining where the gold is free, and amalgamation is used to recover it, when the miner blows the oil through the machine onto the rock the oil adheres to and follows it to the stamp-mill, where it coats the coarse particles of gold and prevents their amalgamation. The result is, this gold is forever lost, because it is too coarse to be dissolved even where cyanidation is used in connection with amalgamation.

The Western lubricating valve admits of changing all this, and instead of the miner filling the machine with oil once a shift, he merely fills the oil-well of the valve, which holds sufficient for more than a shift, and the oil is fed into the machine a drop at a time, and is consumed by the machine instead of being applied to the stope. This valve has other advantages over the common stop-cock, which is in common use throughout the country, in that it is always held in any position desired by the air-pressure flowing through the hollow turning-plug and against the stem, which prevent its opening or closing except when desired by the machine-man. This feature effectively prevents the breaking of front-heads and side-rods, or other machine-parts, when the steel 'shanks' on 'collaring' a hole, which is so common with the old-style stop-cock, which is continually opening and closing, due to the vibration of the machine while running. Another feature of the Western lubricating valve which is a decided improvement over the old-style stop-cock is its self-seating or self-grinding properties. It is provided with a hollow turning-plug or key, through which the air flows against the stem, which holds the valve in its seat at all times, and thus every operation of turning on and off the air is essentially the same as grinding a new seat. The valve is provided with two swivel or 'knuckle' connections, one to the machine and another to the hose-connection, by means of which the wear on the threads in the air-chest of the machine becomes nil, and the hose is absolutely prevented from kinking.

I am informed by The Western Lubricating Valve Co. that these valves are being adopted by such concerns as the Homestake Mining Co., at Lead, South Dakota, which purchased 300 at one time; the Federal Lead Co., Flat River, Missouri, which has purchased 78 in three consecutive orders; the Liberty Bell Gold Mining Co., Telluride, Colorado; the Copper Queen Con. Mining Co., Bisbee, Ariz., which purchased 78 in two consecutive orders; and the North Star Mines, Grass Valley, California, which has 50 valves in use. Also as many as one hundred other mining companies have purchased these valves, which would seem to be proof of merit.

Light Storage-Battery Locomotive.

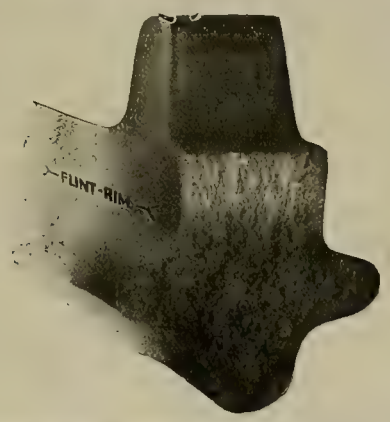
The Comstock Tunnel Co. has recently installed a 4-ton Jeffrey storage-battery locomotive, shown in the accompanying cut, for use in handling the material as it is excavated in its tunnel-extension work. This locomotive is equipped with two 12-hp. series-wound, railway-type motors, and a 42-cell 16-kw.hr. battery, which in service will give an operating range of approximately 300-ton miles on a single charge when the tracks are approximately level. Owing to the great efficiency now attained in battery-locomotive construction, a very large demand has arisen for locomotives of this type for use in tunnel and reclamation-work, and around smelters and large industrial plants where considerable quantities of materials are transported short dis-

tances. Where the hauls are not too long, and the tracks are approximately level, battery-locomotives weighing from 2½ to 7 tons are heavy enough for all ordinary purposes, and the cost of installation ranges from $1800 to $3400, depending upon the size. If the services of from two to six men, otherwise employed in pushing industrial cars from place to place, are thus dispensed with, locomotives in service show a net saving of from $600 to $2000 per year, after deducting all proper charges, including operating expenses, maintenance, depreciation, and interest on the investment. Where the number of laborers replaced does not exceed six, the services of a locomotive are usually required for only a very short time each day. If the work necessitates its being in constant use, a much larger force of men is replaced, and the saving effected is proportionately greater.

The economy in actual cost of operation is often secondary to the saving which indirectly results in all departments from the promptness and facility with which the material is handled. The locomotive in question was supplied by the Jeffrey Manufacturing Co., of Columbus, Ohio, which builds locomotives suitable for every possible haulage-condition, including locomotives of the trolley-type, or combining the battery and trolley features, for use where all or only a portion of the track can be wired to advantage.

Flint-Rim Sprocket-Wheels.

The sprocket-wheel illustrated by the sectional view herewith has been developed by the Link-Belt Co., of Nicetown, Philadelphia, to meet the requirements imposed by the handling of abrasive materials, and by working conditions too severe for the employment of the regular type of cast-iron wheel. The teeth and rim exposed to the wearing-action of chain-contact are hardened to a considerable



depth, and the surface is made smooth and uniform. This improvement in sprocket-wheels not only makes the wheel more durable, but actually prolongs the life of the chain by maintaining the original accuracy of fit between the links and the sprocket-teeth. The makers have coined and copyrighted a trade-mark, 'Flint-Rim,' for the new wheels, which are available in most of the active sizes of the 'Ewart' type of chains.

Metallic Tubing.

Flexible metallic tubing has been on the market for many years, and as time has passed has been brought to a high state of perfection as a conductor for oils, steam, gases, etc., under the highest of pressures. With moderate care, such as any hose should have, metal tubings will last for years, and, being constructed of steel or copper, they remain at full bore at all times, and for suction purposes will stand tons of external pressure. The U. S. Flexible Metallic Tubing Co. manufactures duplex tubings to withstand pressures as high as 3500 lb. per square inch. The single tubes, known as No. 2, with interlocking joint, are made of copper with a diameter of ¾ in., and will withstand a steam pressure of 250 to 300 lb. per square inch. The tubing may be handled with the same freedom as a rubber hose, insuring perfect safety to the handler. 'Metal Hose' is considerably lighter in weight than any other form of flexible hose manufactured. It is more durable, more reliable, and in some instances more flexible, and therefore overcomes

many difficulties contended with by the engineer. The demand for 'Metal Hose' is rapidly increasing. Sales from the factory during 1907 amounted to over 7,000,000 ft., which fact demonstrates its ever-increasing popularity. The manufacturers of 'Metal Hose' have their representatives established in San Francisco, southeast corner of Beale and Mission streets, and in Los Angeles, 450 East Third street.

Commercial Paragraphs.

The Deister Concentrator Co., Fort Wayne, Ind., announces that it has recently sold four of its tables to the Caucasas Copper Co., Ltd., of London, and also eight to the McKinley-Darragh-Savage Mines, Cobalt, Ontario.

Chalmers & Williams, of Chicago, have recently sold Burt rapid cyanide filters to the Guanajuato Con. M. & M. Co., Guanajuato, Mexico; the Rosedale M. & M. Co., Magdalena, N. M.; and Makeever Bros., New York City, for El Tajo mine.

Chas. C. Moore & Co., San Francisco, has recently issued a handsomely printed and illustrated pamphlet describing the steam power-plant designed and built for the Pacific Light & Power Co., at Redondo, California. They will send this booklet to any address on application.

The Lane Slow-Speed Chilean Mill Co., of Los Angeles, announces that it has recently shipped Lane mills to the following firms: Emma L. M. & M. Co., Wadsworth, Nev.; Carr Bros., New York City; Venable Bonding & Leasing Co., Boise, Idaho; Golden Surprise Mining Co., Butte, Mont.; Durazno Mining Co., Los Alamos, Mexico.

The Bailie & Brandt Co. has recently taken over the agency of the Union gasoline, stationery, marine, and hoisting engines in Los Angeles, which includes the management of the salesroom at 210 N. Los Angeles St. This Company is also conducting a 'Machinery Exchange' at 943 N. Main St., where new and slightly used gasoline, steam, electric, irrigation, mining, contracting, and other machinery is bought, sold, and exchanged.

The Denver Engineering Works Co. has recently issued its Bulletin No. 1038, which proves to be a valuable work on modern stamp-mill methods and practices. This catalogue starts with a short description of the various steps in the process of stamp-milling, and while brief and to the point, it gives distinct explanations, sufficiently full to be intelligible and of value to the general reader. Then follow detailed descriptions of the various machines required in a stamp-mill, accompanied by well arranged photographs of the actual machines and parts. This description is followed by a complete specification for a 10-stamp mill, with general drawings, which should be a great help to the prospective purchaser or to anybody contemplating the installation of a stamp-mill. The last ten or twelve pages are given over to sectional drawings and photographs of a number of mills designed by this Company, giving a good idea of the several methods of construction. This bulletin is a valuable addition to stamp-mill literature.

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EDITORIAL.

THE RECENT political changes in Turkey will open up for exploitation one of the richest mineral regions in the world, and will promote an enormous development of industry in the Orient. Railway building will become active throughout Asia Minor in the immediate future. These developments will not be without their effect in strengthening the financial situation, more especially in Germany, and improvement in one country benefits all.

PROFESSIONAL self-consciousness in the best sense is manifestly becoming keener among mining engineers, and the growing tendency toward a solidarity recognizing standards, limitations, and regulations mutually advantageous to practitioner and client, is finding expression in many quarters. We see the Mining and Metallurgical Society of America engaging in discussion over correct procedure, and across the Atlantic the London *Mining Journal* raises the question, 'Should Mining Engineers Advertise?' The fact is they do, and we think of some who are particularly zealous in seeking a conspicuous place where the lime-light may illuminate them strongly. There are good ways and bad for making the world aware of one's presence. It is not always safe to trust to being advertized by loving friends. The question is largely one of good taste, but that is much, and certainly worthy the consideration of all who recognize that a first requirement of any profession, art, or form of labor, is dignity.

THE ELECTION of James Wickersham as delegate to Congress from Alaska is an event we are glad to chronicle, for he has emerged successfully from a campaign of vilification by sheer force of personal character. As judge at Nome, and later at Fairbanks, he brought respect to courts badly bespattered by the corruption of the boom-days, and his re-nomination as judge of the Third District, despite the failure of the Senate to confirm the appointment, proved the confidence of the President. The endorsement of Mr. Roosevelt is an honor to any public man, and it is so esteemed by the more intelligent portion of the public. By that pernicious fiction known as 'senatorial courtesy,' Mr. Nelson of Minnesota was able to prevent confirmation, but it is not too much to say that the action of the President in re-nominating the Judge was a better vindication than anything the Senate could do. In the recent election, the Judge, who resigned his office in order to run for delegate, had four competitors; the voting was decided mainly on local issues, of which territorial government and labor troubles were the most important. The candidate of the labor party made a good race; it is fortunate that he did no better, for he is ill fitted for duty at Washington and his election as a representative of the labor-unions would

have made it impossible for him to represent the wider interests of Alaska. Of the five candidates, Judge Wickersham was the only man of national reputation, and the one best fitted by public service to be sent to Congress. We congratulate Alaska on the result, and we venture to express the hope that the new delegate will co-operate with the Governor in voicing the needs of the Territory in an effective manner. It is known that Governor Hoggatt and Judge Wickersham have quarreled, but both are men built on a broad gauge and of strong character. We hope that they will exhibit enough devotion to Alaska to sink personal differences and work unitedly in the public service of the Territory.

COMMUNICATION between the interior of Alaska and the outer world is maintained during the long winter by means of dog-sledges. The carrying capacity is small, and the cost large. Hence the Government has been obliged to make contracts for a definite weight of mail to be delivered, and the result has been an enormous accumulation, especially of second-class matter, at the points of departure of the dog-teams. With the opening of steamer service in the early summer this huge bulk of reading matter, which should have been available to help beguile the tedium of the winter night, is suddenly flung upon the mining camps, at the precise moment when everyone is too busy to read. In June of this year sixty-five tons of mail were dumped on the beach at Nome by the first steamer of the season! The Government has recognized the growing importance of Alaska, and the needs of its hardy pioneers, by arranging for an adequate over-land mail service in future. Weight remains the basis for contracts, but in doubled amount, and newspapers will go forward expeditiously throughout the coming winter.

Tailing Wheels or Pumps?

THE tailing wheel was heralded ten years or more ago as a satisfactory solution of the vexatious problem of elevating sand in milling practice. It had apparently so many mechanical advantages over bucket elevators or pumps that its supremacy seemed secure. But fixedness is not a characteristic of engineering practice. In the course of development, methods which had been superseded are tried again to test their possibilities under new conditions. The centrifugal pump has once more become the hope of mine-managers on the Rand, and despite its higher consumption of power, the lower first-cost is claimed to overbalance the difference in operating expense. In recent experiments at the Rose Deep, Crown Deep, and other important mines, centrifugal pumps have been operating at an efficiency of from 40 to 45 per cent, and the cost of maintenance has been greatly reduced through the substitution of white-iron liners in place of manganese-steel, the difference in this instance being due to the possibility of producing the white-iron castings at local foundries. The opinion of engineers in favor of lifting sand by centrifugal pumps, and by that interesting spiral device known as the Frenier sand-pump, has been growing in America steadily in recent years. No prudent mill-designer would depend upon a tailing-wheel alone. He necessarily must parallel it with some other mechanism to serve in emergencies. The ruinous costs in milling are not usually those of steady operation, but the demurrage losses resulting from break-downs. The engineer must plan for mishaps as well as for smooth-running, hence the excessive cost of an elevator-plant in which a tailing-wheel is the leading feature. Mr. Walter L. Reid comes to the defense of the tailing-wheel, however, in a letter published elsewhere in this issue. His indictment against centrifugal pumps is severe, and is based upon two counts: excessive consumption of power, and higher cost of repairs. The disproportion, however, looks large, and it may be that the means of measuring power delivered were inadequate, since the horse-power stated for the tailing-wheel would yield the extraordinary efficiency of more than 85 per cent. The question of economy in lifting sand is of such great practical importance that we anticipate a lively discussion of the subject.

Foreign Corporations in California.

THE general principle of comity constitutes the basis of nearly all legislation affecting the rights of corporations doing business outside of the country or state of their origin. Comity does not involve the extension of special privileges, although it is common for foreign corporations to seek and plead exemption from the laws of a host when they are found burdensome. It is certainly all that could be expected if the laws of a State concede equal rights with domestic corporations, which is the condition obtaining in California. A correspondent asks the authority which this implies to over-ride the provisions of a charter or articles of incorporation, harking back to that persistent plea of the foreigner for immunity which springs easily, like the proverbial 'hope eternal,' in the financial breast. The State is primarily concerned with the adjustment of relations between the legal persons within its borders. It has no jurisdiction outside those limits. But it admits no interference of another State in its administration of justice within that jurisdiction. Manifestly then the claim of a stock certificate that it represents a certain number of fully-paid shares in a corporation has no significance to the California court other than as it shows the fractional interest in a professed capitalization which any plaintiff or defendant may possess. And the shareholder, if coming bodily within the jurisdiction of the State, may sue or be sued. The State may not send its officers to hale foreign stockholders into court, but he whom it can reach it may adjudge, and if the case be one involving indebtedness of the company of which such person is a representative, he is liable for his share of that indebtedness *pro rata* with the amount of his holdings of stock, quite irrespective of what the stock may actually have cost him, or of the exemption from assessment or other liability which may be proclaimed in the articles of foreign incorporation. In California the foreign is placed upon the same footing as the domestic company, subject to like restrictions and obligations, and

given equal prerogatives. The home company is compelled to register with the Secretary of State as well as the foreigner; both are required to pay the same license fees; both are subject to the same penalties. These consist primarily in liability to a fine of $500 for failure to register within ninety days; next in the denial of the right to maintain or defend actions in the State courts, and finally in exemption from the benefit of the statute of limitations. These penalties, beginning with a fine for negligence, intended to compel compliance with the law on the assumption that the corporation had interests valuable enough to protect, terminate with a denial by the State of the legal existence of the recalcitrant organization. It is upon this theory that such a company is refused the right, not only to initiate, but even to defend an action. Being no longer known as a legal entity, it cannot be admitted into court as a defendant, the case goes by default, and judgment is rendered accordingly, which may be satisfied, first out of any remaining assets, and, in excess of these, by further action against any stockholders found within the jurisdiction of the State for their proportionate part of the unsatisfied judgment. This theory has been affirmed by the United States Federal Court (Diamond Glue Co. *v.* United States Glue Co., 103 Fed., 838), where the foreign corporation had brought action, and the defense, sustained by the decision, rested on the mere affirmation of incompetency of the plaintiff to appear as such because of failure to comply with the statutes of California. The Federal Courts have, in this and in other cases, distinctly held that only as an act of comity is a foreign corporation admitted to do business under the protection of the laws of another State.

A Mexican Wild-Cat.

WE do not refer to Las Dos Estrellas Company in the remarks we are about to make. To those who may not have watched the miners' luminaries rise out of earth into the financial skies we will submit that the Dos Estrellas shines as a double star of exceeding brilliancy. The real Dos Estrellas mine is situated at Tlalpujahua, State of Michoacán, Mexico. It has a modest capitalization of ₱300,000, equivalent to only $150,000 United States currency. The production from the mine was so great that the shares, having a par value of ₱100, were eagerly purchased at ₱10,000, and French capitalists adjudged them a good investment even at that price. From the present undiminished output the judgment of the Frenchmen seems justified. It is manifestly because of the existence of this phenomenal mine in Michoacán, with its world-wide fame, that another company has taken to itself the name 'Dos Estrellas Mines & Development Company,' under which borrowed lustre it may dazzle the public and attract the class that would buy lottery tickets if it could. The prospectus which has been issued promises such marvelous profits that it seems a pity to have sacrificed the opportunity of establishing a new name in glory. The company owns three mines, wherefore it might without violence have called itself the Tres Estrellas Mines & Development Company. There would have been no serious danger of confusion with the Dos Estrellas in that event, especially since the mines of the new company are in the State of Guerrero, hundreds of miles distant from the great Dos Estrellas of Tlalpujahua.

The new company is unique in several ways. There may be more unique features than one is able to discover without becoming a stockholder. It seems to be a Mexican concern in reality, though it exists under the laws of Arizona, with a nominal capital of $2,500,000 gold. The President is Gen. De La Paz Alvarez, the Vice President Juan Antiga, and the Secretary and Treasurer Licendro Maldonado. The promoters are Harvey A. Willis & Company of New York, who are literally giving away a sure thing for nothing. From their statement no funds are apparently needed for any purpose. The mines and works are leased to the Mutual Trust Company of Mexico for nine years. During the first five years the Trust Company is obliged to pay to stockholders of record dividends at the rate of two per cent monthly in addition to a royalty of fifteen per cent of the net value of the ore extracted. During the remaining four years of the lease the dividends, which the Trust Company agrees to pay, amount to forty per cent, plus five per cent of the net value of the ore. At the expiration of the lease the property, including all plant, is to be turned back to the holding company. In the face of this extraordinary contract, whereby a trust company assumes all the risk and the owner is guaranteed a princely income without effort, expenditure, or anxiety, the promoters feel called upon to explain why the stock is offered for sale. The explanation is even more re-remarkable than the contract with the Mutual Trust Company. "Mexican bankers are desirous of building up prestige in the United States. They realize that the condition of the masses in their country can only be improved by the introduction of new capital. . . . This offering is made to build up an American following," since forsooth they have more sure things to donate later. This is exceedingly altruistic and beautiful, but it isn't business. The Mexican gentleman is looked upon as an astute financier. The American who thinks he can beat him at a bargain usually receives new light before the transaction is ended. In fact these worthy gentlemen who organize a corporation in Arizona instead of submitting to the stricter corporation law of Mexico, have evidently looked admiringly upon the sheep-shearing operations of Lawson *et al.*, and have drawn the logical conclusion that a great deal of wealth exists in the United States which is easily detached from its possessors. They have manifestly observed that the more preposterous the lure, the more readily do the people answer with their golden offerings. There are a great many very foolish people in America, but it is painful to have the fact brought home so pointedly by foreigners. The Mexicans used to be too courteous to remind us of our weaknesses. Surely we must be Americanizing Mexico faster than anyone suspected.

Personal.

W. E. Thorne was in San Francisco last week.

H. Foster Bain is making an examination of the Illinois coalfields.

L. de Tourniel was in San Francisco last week, and will soon return to Nicaragua.

E. Y. Pomeroy is with the Black Mountain Mining Co., at Magdalena, Sonora, Mexico.

John Randall has moved his headquarters from Santa Fe, New Mexico, to Tolland, Colorado.

A. A. Hassan, of Toronto, has gone to Ontario and Quebec for examination and exploration work.

Douglas Waterman is making an inspection of mining properties in Butte and Plumas counties, California.

H. F. Lefevre, of Reno, spent some time last week at the Butters plant at Virginia City, making cyanide investigations.

W. A. Scott, special traveling correspondent for the Mining and Scientific Press, is expected in San Francisco next week.

Walter J. Morris has gone to La Yesca, Tepic, Mexico, to take charge of the cyanide plant of the Zopapon Mining Company.

Wilbur A. Hendryx, of Denver, has gone to New York. From there he goes to the State of Zacatecas, Mexico, on examination work.

William S. Mann, general manager for the Boston & Oaxaca Mining Co., at Tlacolulu, Oaxaca, Mexico, has gone to Boston on business.

E. J. Moore, Colorado manager for the Mining and Scientific Press, has returned to Denver after a three weeks' trip to the Pacific Coast.

T. A. Rickard will return to San Francisco the first of next week, after a three months' journey through Alaska and the Yukon Territory.

Robert K. Painter, of New York, has recently returned from a month's trip to Nevada, where he has been examining mines for Eastern clients.

Herbert C. Enos, of Johnson & Enos, mining engineers of Mexico City, has just returned from a three weeks' trip in the State of Hidalgo, Mexico.

Juan Felix Brandes, recently in the Parrall district, is now in Colorado, and will return to London in two weeks.

J. Gordon McLaren expects to be in San Francisco in October.

Richard A. Parker, of Denver, has recently returned from an inspection of the Hercules mine, at Silverton, Colorado, and has now gone to Chicago, Cleveland, and Boston.

Godfrey D. Doveton has joined the staff of Spurr & Cox, Inc., as metallurgical engineer, and will be exclusively associated with that organization. Mr. Doveton's address for the present will be the Mexico City office of Spurr & Cox.

C. N. Gould, professor of geology at the State University, has been made Director of the Geological Survey of Oklahoma. The Geological Commission organized recently by electing Governor C. N. Haskel president, State Superintendent E. D. Cameron secretary, and President A. Grant Evans of the University, executive officer. Field studies of the oilfields have already been taken up.

L. Vogelstein & Co., New York, give the following figures of German consumption of foreign copper for the months January to July, 1908:

	Tons.
Imports of copper	94,501
Exports of copper	4,754
Consumption of copper	89,747

The consumption during the same period in 1907 was 68,763 tons. Of the above quantity 87,373 tons were imported from the United States.

Latest Market Reports.

LOCAL METAL PRICES—September 17.

Antimony	12@16c	Quicksilver (flask)	$40.50@43
Casting Copper (scrap)	8½@13½c	Spelter	6½@ 7¼c
Pig Lead	4.95@ 5.90c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept. 10. £. s. d.	Sept. 17. £. s. d.
Camp Bird	0 13 9	0 13 3
El Oro	1 6 6	1 7 6
Esperanza	3 3 6	3 6 6
Dolores	1 10 0	1 10 0
Oroville Dredging	0 11 0	0 11 9
Stratton's Independence	0 1 0	0 1 0
Tomboy	1 3 9	1 3 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Sept. 11	13.50	4.56	4.80	51⅝
" 12	13.50	4.56	4.80	51⅝
" 13	Sunday.	No market.		
" 14	13.43	4.53	4.80	51⅝
" 15	13.43	4.53	4.80	52⅛
" 16	13.43	4.50	4.80	52⅛
" 17	13.43	4.50	4.80	52¼

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Sept. 10.	Sept. 17.
Amalgamated Copper	77½	74⅝
American Smelting & Refining Co	93⅝	85⅝
Boston Copper	12½	12
Butte Coalition	——	23½
Cumberland Ely	8	7¾
Dolores	6½	6¼
El Rayo	3¼	3¼
Giroux	4	3⅞
Greene-Cananea	11⅛	10¼
Indiana Sonora	5⅛	5
La Rose	6¼	6⅛
Miami Copper	11	10
Nevada Consolidated	16¼	14⅞
Newhouse	5¾	5¾
Nipissing	8⅝	8⅜
Ohio Copper	3	3⅛
Tennessee Copper	38½	37⅜
Utah Copper	44⅝	41½
Yukon	5¼	4½

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 17.

Atlanta	$ 23	Laguna	$ 1.20
Belmont	1.05	Manhattan Con	8
Booth	44	MacNamara	45
Columbia Mtn	24	Midway	30
Combination Fraction	1.27½	Montana Tonopah	99
Daisy	60	Nevada Hills	1.25
Fairview Eagle	35	Rawhide Queen	75
Florence	3.90	Sandstorm	23
Gold Bar (Bullfrog)	4	Silver Pick	18
Goldfield Con	5.95	St. Ives	28
Gold Kewanas	35	Tonopah Extension	65
Great Bend	30	Tonopah of Nevada	7.50
Jim Butler	23	Tramp Con	16
Jumbo Extension	38	West End	54

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. September 17.		Closing prices. September 17.
Adventure	7½	Mohawk	61½
Ahmeek	100	Nevada Con	14⅞
Allouez	35	North Butte	79
Amalgamated	74⅝	Old Dominion	40¼
Arcadian	3½	Osceola	107
Atlantic	15	Parrot	25
Bingham Con	50	Phœnix	50
Boston Con	12	Quincy	90
Butte Coalition	23¼	Rhode Island	4⅛
Calumet & Arizona	117	Santa Fe	1¾
Calumet & Hecla	650	Superior & Pittsburg	19¼
Copper Range	73¼	Tamarack	70¼
Daly-West	9	Trinity	17
Franklin	12¾	United Copper Con	11⅜
Granby	100	Utah Copper	43½
Greene-Cananea, ctf	——	Victoria	4¾
Isle Royale	21	Winona	5½
Mass	6¼	Wolverine	144

General Mining News.

ARIZONA.

COCHISE COUNTY.

The work at the Superior & Pittsburg is being pushed with great vigor, and according to late reports from the properties, good progress is being made. An official of the Company states that during the past two weeks one of the biggest finds yet made was reported. A body of ore 40 ft. wide has been opened up on the 1300-ft. level of the Hoatson mine, on the Del Norte claim, and although no report of assays has been made public it is understood that the ore is of excellent grade and the outlook for a heavy tonnage is said to be good. The Superior & Pittsburg properties are at present shipping about 100 cars of ore per week to the Calumet & Arizona smelter, at Douglas, and the shipments will be increased as soon as the smelter is enlarged.

GILA COUNTY.

(Special Correspondence).—At a distance of 25 to 40 miles from Globe in Pinal and Gila counties on the opposite side of the Pinal Mtn. and along the Gila river is a new copper district about which comparatively little is known by the public. This new district has produced some copper during the last few years and promises exceptionally well for the future. The heavily mineralized zone extends from the Ray country on Mineral creek a distance of about 20 miles to the locality of Christmas, where the Saddle Mountain Mining Co. has done considerable work and produced about 5,000,000 lb. of copper with some gold and silver. At Ray there is the one large company, the Ray Consolidated, with extensive holdings, together with a number of smaller companies, one of which, the Big Lead, was a year ago operating two small concentrating plants which have been closed since the panic. The copper deposit at Ray covers a large area, apparently limited in depth to a few hundred feet. It is a straight concentrating proposition, the copper being mainly in the form of calcocite, the ore carrying on an average of from 2 to 3%. Active development was being done on a large scale until last fall, and since then churn-drilling has been done continually, proving more thoroughly the immense deposits. Next to the Ray country is the property of the Troy Manhattan Mining Co. Here some $800,000 has been expended, much of it with bad judgment. There are a number of shafts sunk and one long adit has been driven. Along the extension of the same range of mountains, at a distance of about 10 miles from Troy, is a large group of claims owned by the London Arizona Copper Co. The property of this Company was extensively advertised in Los Angeles a little over a year ago. The advertisements absurdly exaggerated the ore in sight, but a good deal of shallow development work has been done which has shown up some excellent carbonate ore. The claims are situated between two localities where extensive eruptions have occurred. The ore, as far as known, is mainly in the limestone, which is on top of a hard quartzite and is broken frequently by eruptive dikes and fingers of porphyry. Adjoining the London Arizona property on the west side are the Snyder and McHugh groups, both showing considerable copper, and on the east the holdings of the Saddle Mountain Mining Co. At the latter more work has been done than any place in the district. On the surface are large quarry faces of carbonate ore and underground good bodies of sulphides, mainly chalcopyrite, have been developed. The ore is in the altered lime along porphyry contacts, often extending out a good distance from the porphyry. Although low grade, averaging about 3% copper, it is absolutely self fluxing, carrying about 20% excess base. A large tonnage can be worked in quarries, and underground the ground holds exceptionally well, practically no timbering being necessary. Eighteen months ago the Company had about 500 men on its pay-roll, a great number of whom were on railroad and other construction work; was smelting from 175 to 200 tons of ore per day, and actively pushing the mine development. The Company was putting its profits, together with additional money from the sale of stock, into development and construction work and new material. At present practically no work is being done. Through the entire district the properties are almost universally backed by good men with every intention of developing the section into a large and steady producer. At present, as well illustrated by the Ray Consolidated Co.'s deal with Hayden Stone & Co., the directors and owners of the various properties are preparing to begin operations in the near future; and during the next few years this district will undoubtedly attract a great deal of attention.

Globe, September 12.

GRAHAM COUNTY.

The Southwestern Development & Improvement Co. has not yet resumed operations on the Polaris property, although it is reported that funds will be forthcoming in the near future.——It is reported that the New England & Clifton plans the building of a concentrating plant at the Copper King mine, several miles above Clifton. The Company has a good mill-site on the banks of the Frisco river, with ample water-power available.——The New York Arizona Co., which is developing valuable gold claims in the district west of Morenci, made a strike last week of four feet of ore which, it is claimed, will assay $70 per ton. The find was made in the breast of the Lillian adit, 800 ft. from daylight.

MOHAVE COUNTY.

The Arizona-International Mining Co. is planning to start extensive operations at the old copper camp, 12 miles east of Yucca. Fred W. Morrison, of Los Angeles, who is president of the Company, was at the property recently making plans for raising money to purchase a complete equipment.

SANTA CRUZ COUNTY.

(Special Correspondence).—Work has commenced on the Cunningham group of claims in the Mowry district. A shaft has been started and will be sunk to a depth of 200 ft. The shaft is now down about 40 ft. and a whim is being put up to take the place of the windlass. Five claims comprise the group.——Adjoining this is the Augusta group of claims, belonging to Ed. Burks, Fred Miller, and M. Marstellar. They have a 90-ft. shaft on a vein of iron-stained decomposed porphyry. At the bottom of the shaft the vein is 6 ft. wide. From the shaft a drift has been run 50 ft. on the vein and some good ore taken out. The ore carries zinc, copper, gold, silver, and lead.——At the Four Metals mine, in this district, the adit has cut through the orebody in which it has been driven for the past three months. From the time of cutting into the orebody, until the narrow wall of granite was reached, the adit ran through 175 ft. of ore. During the past few weeks S. F. Johnson, the manager, has added 14 claims to the original group of 17, and a surveyor from Patagonia is now on the ground surveying for patent the entire group of 31 claims.

Patagonia, September 12.

YAVAPAI COUNTY.

The Tip Top Mining Co. is to lay 1100 ft. of new track in its adit and stope a large body of tungsten-ore which is now blocked out on that level. It is the intention to unwater the main shaft, which follows the vein, to a point 600 ft. below the mouth of the adit. The Tip Top mine was one of the large silver producers of the country in the 70's. Work ceased on it when the price of silver fell below the dollar mark. Later the mill was partly dismantled by the removal of all the machinery adapted to the treatment of gold ore. This will necessitate the replacement of that machinery before the product of the mine can be treated on the ground.——The Black Chief Copper Co. has purchased a complete hoisting plant, and the development of the Uncle Sam group in the Black Hills district will be resumed. Sinking the main shaft was abandoned at a depth of 84 ft. on account of the great inflow of water. The group, comprising six claims, is developed by several shallow shafts and adits, ore being exposed in all openings which gave assays returning 22% in copper.——The Etta mine, on the eastern slope of the Black Hills range, 15 miles

south of Jerome, has been sold to an Eastern syndicate. A cloudburst recently carried away all the mining timbers, several hundred cords of firewood and ore buckets, besides wiping out of existence the dump at the mouth of the tunnel and shaft, which contained a large amount of ore of fair grade.——The mill of the Monica Mines Co., 13 miles south of Kirkland, has recently been overhauled and put in shape. The ore is crushed in a Blake crusher and fed automatically to the 15-stamp mill, where it is crushed in cyanide solution. It is claimed that an extraction of 78% is obtained on the plates and a further saving in the cyanide plant brings the total up to 95%. E. S. Pettis is consulting engineer. Due, it is said, to internal dissensions among the stockholders, the affairs of the Company are badly involved and bankruptcy proceeding were instituted last week. C. E. Bunker has been appointed receiver and all those acquainted with the property are satisfied that a few months operations will clear off all indebtedness.

YUMA COUNTY.

William Wilson and George W. Glowner have sold their General Grant claim, in the Ellsworth district, 10 miles north of Vicksburg, to John S. Wright, of St. Louis, for $85,000. An application for patent has been filed.

CALIFORNIA.

ELDORADO COUNTY.

The work of unwatering the Eureka mine, at Georgetown, was started last week. When the mine is again dry and the needed repairs have been made, extensive developments will be undertaken.——Twenty men are em ployed at the Alpine mine, which is under bond to Nixon & Wingfield, of Goldfield, Nevada. The shaft is nearing the 400-ft. level and drifts are being driven along the vein both ways from the shaft. It is rumored that a milling plant will be built in the near future.——The Douglas Mining Co. has been incorporated to acquire and operate mining property and do a general mining business. T. H. Douglas, of Sacramento, is president. The Company owns valuable mining property in Eldorado county, and has recently completed the erection of a roller mill in the vicinity of Bear creek, east of the main road from Placer ville to Georgetown on what is known as the Waggoner mine. Owing to failure of the water supply the mill cannot be operated until the power plant, now under construction, is completed.

NEVADA COUNTY.

(Special Correspondence).—A good shoot of ore has been struck on the Greek vein in the Union Hill mine. The mill is running steadily on ore averaging $14 per ton.——A station is being cut at the 500-ft. level of the Norambagua and a 10-drill compressor will be installed.——The Brunswick mine has suspended operations and the underground machinery will be immediately taken out.——The adit at the Bear River mine has been practically completed. It is about 500 ft. long. Four veins have been opened up. The main vein is over nine feet wide. The Company is arranging to incorporate and work the mine extensively.——The North Star Mines Co. has purchased the Larimer quartz claim for $26,000. The claim adjoins the North Star group and contains seven water-rights.——Arrangements are being made to install a hoist and pump at the Hill mine. Developments will be actively pushed.——Active developments have commenced at the Grant claims, near Graniteville. E. B. Smyth is superintendent.——Joseph Weisbein has made arrangements for the re-opening of the Gold Flat mine, and active work will commence within a short time. Good ore was exposed in the shaft when the mine was last worked.——Joseph Hales and John Sincock are about to commence work on their claim, adjoining the Union Hill mine. The 170-ft. lower adit will be driven farther to cut the main vein.

Grass Valley, September 14.

PLACER COUNTY.

The mill at the Lee mine has been shut down, due to scarcity of water.——The Bellevue is driving on a 2-ft. vein at the 400-ft. level. Forty tons taken from this level was run through the Malmberg mill last week and the clean-up amounted to 75 oz., valued at $1200.

SIERRA COUNTY.

Fred Bruckerman, of Poker Flat, has bonded his gravel claim in Stud Horse ravine to Los Angeles parties. The bond is said to be for two years and a half and the price $5000.——Sixty-five men are working at the Brandy City mine and head-dam. A large part of the flume has been completed. It is to be nine miles long, taking water from Little Canyon creek to Brandy City for hydraulicking. The improvements as contemplated by the Company will amount to $200,000 before the water is turned on.

TRINITY COUNTY.

The Chloride-Bailey and Globe mines, near Dedrick, are to install an electric power-plant, and W. D. Pinkston, one of the owners, is now in San Francisco purchasing the machinery. A 10-stamp mill will be operated.——The strike made a few weeks ago in the West China adit is now showing up to be one of the richest finds made in Deadwood for many years. The ore has been opened up a distance of 75 ft., and the face of the drift shows 11 ft. of solid quartz.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Buffalo M. & T. Co., operating the Magnet mine through the Doric adit, in carrying the stope to a height of 190 ft. have exposed a streak of smelting ore that is from 1 to 4 ft. wide. A shipment of two carloads was made last week, and although several tons of waste rock was included, settlement was effected at the rate of $48 net per ton. It has been decided to henceforth mill the product in two classes, as assay tests show the first grade to be worth $185 per ton in gold, silver, lead, and copper. A force of 30 men is now employed. Within the near future the adit is to be driven forward, as a number of veins are controlled lying ahead of the present breast. J. Larsen is superintendent.——The Raymond adit, on Griffith Mtn., this week intersected the Valentine vein at a distance of 950 ft. from the portal. A number of small streaks of mineral are in evidence, but the full extent of the discovery will not be ascertained until the hanging wall is reached. J. Raymond is manager.——A good showing is resulting from the development of the Shively, Brown Mtn. In extending the east drift from the 500-ft. level, a streak of ore is exposed for a distance of 60 ft. that is from 4 to 6 in. wide, the value of which is 978 oz. silver per ton. Stoping has been started, and B. J. Martlon, the manager, will start regular shipments in a few weeks. It is intended to continue the drift for 75 ft. A good force of men is being employed in repairing the old workings, to permit of the extraction of the bodies of medium and low-grade ore that were left during the early history of operations, when none of the product was handled that carried less than $100 per ton. A concentrator of small capacity will be erected during the winter months.——The assay and sampling plant at the Capital mines has been completed and now all concentrate and smelting ore are being tested previous to shipping to the local sampler. This will permit of all ore carrying more than $25 per ton being kept separate from the milling grade. F. Graham has been made manager. The east and west Aetna drifts have been run for 900 ft., and the orebody is exposed for the entire distance. Eight raises are being made and for 150 ft. the streak has been proved.——A meeting of the stockholders of the Two American Sisters M. M. P. & E. Co. was held in Georgetown this week, at which time the sale authorized some weeks ago by the board of directors was ratified. S. Peacock and J. A. Mears, the purchasers, are now employing a force of 40 men at the mine, and extensive development is in progress. The consideration was $200,000, and it is now understood that the electric plant two miles below Georgetown is also to be purchased, for $100,000. This plant has a capacity of 550 hp., with an excess guarantee of 25% during high-water period. Power is being sold throughout the vicinity of Columbian Mtn. Work in the mine is being centred on the 160 and 275-ft. levels of the

Headlight shaft, and driving and stoping are in progress upon fine bodies of ore. The 50-ton concentrating plant has been thoroughly overhauled, and since starting the machinery two weeks ago a high saving has been effected. ——The Marshall-Russell adit, on Miller Mtn., has been advanced 2300 ft. According to surveys, the Neef vein will be reached at any time. This vein was a good producer from shaft workings, the estimated production being $75,000. Progress on the main adit is being made at the average rate of 6 ft. per day, and it is understood that funds have been provided for the continuation of work for a period of six years.——Butler & Co., leasing on the Wheeling vein through the Tobin adit, are sending out semi-monthly shipments of $50 ore. A small streak of telluride of silver is running through the main streak, which brings returns of from $4000 to $7000 per ton in gold, silver, and lead.——Miller & Co., leasing on the same property, have sold their privileges to the Waldorf Metals Co., which recently secured a 10-year lease on a large part of the holdings of the Waldorf M. & M. Co. Work is under way and the force is being added to from time to time.——Report is current that a deal will shortly be closed whereby the Santiago mine, in East Argentine, will be transferred to a syndicate of Eastern men, the consideration being said to be $500,000. This property makes the finest showing of any to be found in that locality. Lessees have been notified that they need not expect an extension of their privileges with the expiration of the same, and as a result every energy is being brought to bear for the extraction of as heavy tonnage as possible.——A new company is being organized to develop the Pilz group of claims, and it is understood that a working fund of $20,000 has been provided. The adit is to be driven forward. G. S. Redd, of Denver, is manager.

Georgetown, September 12.

LAKE COUNTY.

An important strike was made during the week on the Big Six, at Leadville, at the 750-ft. level. At this point the lessees are running an incline shaft toward the Penn territory, and a few days ago struck a body of lead-silver ore that runs high in the white metal. The whole breast of the incline is in ore and some of the assays taken from the orebody run as high as 325 oz. silver and a good percentage of lead.——The Leadville-Belvidere adit in the Horseshoe mining district is now on a paying basis, and while the work of driving the bore continues, the property is producing regularly a fair tonnage of good ore, which contains principally zinc. The promoters of this property hope to have it one of the heaviest producers in the district in the course of time.——An increase of over 3000 tons over July is figured by the railroads as representing the output of the Leadville district for August. It is admitted, however, that this increase, even small as it is, does not represent the substantial growth of activity. Most of it was occasioned by work being done on the various dumps in California gulch and on Fryer hill. However, much work is going on which is not represented by tonnage figures. This includes the new tunnel proposition and development work on many shafts in the district. The Dinero and other properties west of the river, are employing many men, but not shipping anything, as they do not expect to reach shipping material for quite a while.

OURAY COUNTY.

A small force of men is now at work on the Sutton group, on Mt. Hayden, excavating for buildings and driving the cross-cut drift to the Denver lead. It is probable that an electrical equipment will be installed instead of air-plant.——It is probable that work will soon be started on the Blowout adit of the Ouray Con. Mines Co. The assessment work has not been done for this year, and it is the plan of the Company to continue work when it is once started.——The manager of the Neosho has gone East, where he will confer with the officers of his Company concerning the installation of a large plant of machinery on the Neosho. The work is going on with hand-drills and it is likely that while East an order will be placed for a large plant.

SAN JUAN COUNTY.

The August shipments from Silverton amounted to 2000 tons of concentrate and 1075 tons of crude ore. The Gold King will be running again this month and will swell the shipments for September.——It is reported that the Ross Mining Co. will make another test run on ore from the Champion mine at the Contention mill, before proceeding with the erection of its own plant.——The Bagley adit, at Animas Fork, cut the Red Cloud vein last week at 5800 ft. from the portal. The vein at this point is 12 ft. wide, but does not contain mineral in payable quantities. Driving to the east has been started to reach the well known orebodies in that direction.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—A new water-driven air-compressor is to be installed at the property of the Aeolian Copper Co. and the ground for the building is now being graded. The compressor will have a capacity of two drills. A long flume is also being constructed by the Company to connect with the waters of Deadman gulch. In addition, a large amount of money is being expended on new equipment. The property is being financed by a syndicate of French capitalists.——A six months' lease of the property of the Idora Mining Co. has been given to F. M. Mark, Edward Lugen, and Robert Weedy. The lease goes into effect at once and requires that the lessees sink and stope from the upper workings.——Another encouraging announcement to the miners of this district is the statement recently issued to the effect that work on the property of the Vienna-International Co. will be resumed in the near future. This property has long since passed the prospect stage, and with the proposed expenditure of between $15,000 and $20,000 steady shipments will commence. A 4000-ft. flume is being constructed to connect with Placer creek. During the week the annual meeting of the Company was held, and with one exception the old board of directors was re-elected. W. B. Lively is president.——The annual meeting of the stockholders of the Advance Mining Co. has recently been held in Wallace, at which officers and directors were elected for the ensuing year. A large amount of development work has been done on the property and the progress made during the past year was satisfactory to the stockholders. It was decided to let a contract for 100 ft. of work at once, a contract for a similar amount having just been completed.——A $40,000 bunk-house for the accommodation of about 150 men is to be erected at the Morning mine, at Mullan. Surveys for the work have been made and the contract will be let at once. The new building will be about 100 yards from the Company's offices and near the mill. An attempt will be made to have it completed before the cold weather sets in. The present bunk-house affords accommodation for only about 50 men. ——The Iron Mask property, in the Carter district, appears to be on the verge of big things. In spite of the fact that this concern was organized only this spring, reports would indicate that the mine already has good concentrating ore. The men at work there report that in the last few days they have gone through 15 ft. of good ore and have not yet reached the foot-wall. Here they expect to find about two feet of clean shipping ore similar to that in the adit of the Broken Hill property, operating on the same vein. The adit on the Iron Mask has been driven about 1000 ft. and gives a depth of between 500 and 600 feet.

NEVADA.

ELKO COUNTY.

Al Myers and Richard Whittemore, of Goldfield, have bonded the Chambers group of claims, 2½ miles west of the town of Lee, the consideration being $20,000. It is believed that work will be started at once in sinking an exploration shaft. Practically no work has yet been done on the property, but the surface showing is said to be good.

ESMERALDA COUNTY.

The Goldfield Merger Mines Co. started actual work last week and is now sinking the shaft on the Gold Horn at

the rate of six feet per day. This new Company is the recent consolidation of the Velvet, St. Ives, Gold Horn, and Potlatch groups.——The Baby Florence lease on the Florence Goldfield has been granted an extension of 30 days, carrying it to February 6 at midnight, and the Gem Florence on the same property received a six months' extension. ——L. L. Mushett and associates, who own a one-half interest in the Mushett lease on the Miss Jessie claim of the Laguna, have purchased the remaining interest from the Goldfield Gold Mountain Mining Co. A heavier plant of machinery has recently been installed and a large production is promised for the future.——George B. McClellan has taken a lease on the upper vein of the Nevada Cottonwood Mines Co., at Stimler. He is putting up machinery and cross-cutting at 100 ft. Rich ore was found in sinking the shaft, two feet assaying as high as $116. Two other leases have been let on the property.——The mines of Goldfield produced during the week ending September 12 a total of 2552 tons, estimated to be worth $170,500. During the same period the Tonopah mines produced 6040 tons of an estimated value of $160,800.

HUMBOLDT COUNTY.

The Seven Troughs Columbine Mining & Milling Co., owning the Key West and Colorado claims, in the Seven Troughs district, is arranging to start work upon its property soon. Good surface assays have been obtained, and

Seven Troughs, Nevada.

its proximity to other producing claims make the prospects bright.——W. R. English, of the English-George-Preston lease, near Mazuma in the Seven Troughs district, will place a hoist on the lease.——The hoist and head-frame for the new vertical shaft of the Seven Troughs Kindergarten Mining Co. arrived in Lovelock last week, and will be installed at the shaft at once. The engine is 25 hp. and the plant will constitute one of the best mine equipments in the Seven Troughs district, and will be amply fitted in every way to handle the large ore tonnage for the mill to come from below the 350-ft. level. The Kindergarten shaft, which was started less than six weeks ago, has reached the 110-ft. point. The work of sinking has been pushed with great speed during the last 10 days, during which time two shifts have been working.——With its newly completed ore-bins filled with ore, the Reagan lease on the Mazuma Hills estate began the second mill-run at the Mazuma Hills mill last week. Three hundred tons will be treated.

LINCOLN COUNTY.

Alunite, a new camp 23 miles southeast of Las Vegas, has been attracting attention during the last month. The Hill Syndicate, of New York, has been interested in that locality for some time, and, in fact, it was Robert T. Hill, the head of that concern, who first discovered the presence of alunite there, and at once realized its significance. Alunite has usually been found, when present in considerable quantity, associated with rich gold ores, this relation having been especially noteworthy at Goldfield, so that an alunite-type of gold ore has become recognized by economic geologists. It is said by those who have visited the new district that the formations at Alunite duplicate those at Goldfield, and that the prospects are better. Many shafts are being sunk and the rush to the new camp is on. ——The Pioche Water Co., the stock of which is owned jointly by the Ohio-Kentucky and Nevada Utah Mines & Smelters corporation, has decided to make some needed improvements in its water system at Pioche. In the town the old mains are to be torn up and replaced with new. But the first work to be done will be that of installing two large reservoirs capable of storing 200,000 gal. of water. Ernest L. Godbe is manager of the water company and has been instructed to go ahead with the proposed improvements.——The Searchlight Consolidated resumed operations at the Oregon last week. H. L. Norman is in charge of the work. The main shaft is now being unwatered, preparatory to continuing sinking.——The Searchlight-Parallel has leased the Cyrus Noble mill and is treating the dumps at the Elvira and the Birdie shafts. This work is only preparatory to starting underground development.

NYE COUNTY.

The Edelweiss Co., operating on the east slope of Ladd Mtn., is grading for the installation of a whim. The shaft is now down 110 ft., and sinking will be resumed when the whim is installed.——The Panion-Faulkner mining property, at Manhattan, has been sold to a group of San Francisco men, represented by W. J. Roderick, of Manhattan. The new owners contract to continue the shaft

Mazuma, Nevada.

down 65 ft., to the 200-ft. point.——After a lapse of 20 years, work has been resumed on the old Belmont property, near Manhattan. James Shea, Dick Roberts, and Briz Putman have secured a lease, and will put in a 25-hp. hoist. The incline-shaft is 1100 ft., giving about 600 ft. verticle depth. The lessees will unwater the shaft and begin taking out ore.

WHITE PINE COUNTY.

The Alpha shaft of the Giroux Consolidated has reached the 1200-ft. point, and the work of cutting a large station has been begun. The winze from the 1000-ft. level is down 90 ft. below it, and is still in the big body of copper ore that runs 17% copper, and is rapidly being deepened with as large a force as can be worked to advantage.——The St. Lawrence Mining Co., whose property is in the old Shoshone district about 50 miles southeast of Ely, will soon start construction on a 100-ton mill in Lincoln canyon. The foundations will be put in this fall and actual construction of the mill and an aerial tramway will be rushed next spring. The ore is said to contain 60% lead and some silver.

UTAH.

SALT LAKE COUNTY.

The Little Eddy Mining Co. has closed a deal with the Utah Copper Co., whereby the latter comes into possession of certain surface rights on the Little Eddy group of claims in Bingham for a consideration of $12,500. With the rights secured from the Puritan Gold & Copper Co., which owns a property adjoining, the Utah Copper has secured about 28 acres which is to be used as a dumping place for the overburden removed from the copper-bearing porphyries of Bingham. It is also to be utilized for railroad tracks, the right of way of the proposed Bingham & Garfield railroad

crossing over the ground just acquired.——A body of rich carbonate ore has been cut in the High Line adit of the Tom Moore property, which is said to run as high as 68.9% lead and 80c. in gold. The Tom Moore is owned by Mr. and Mrs. T. M. Surbaugh, of Salt Lake, and the estate comprises approximately a mile square of ground. The owners have been developing it as they could, without incorporating, for a number of years, and they have opened fairly good showings in several places.

SUMMIT COUNTY.

An assessment of one cent per share has been levied on the stock of the Copper Apex Co., delinquent on September 21. Work has been resumed in driving the adit and development will be pushed.——The Western Monitor is advertising for bids for sinking its shaft 100 ft. deeper. Preparations are being made to carry on work all winter, and to that end the buildings have been repaired and a storage water-tank put in.——At the meeting of the stockholders of the American Flag Co. held at the mine last week the present board of directors was re-elected and routine business transacted. The Company's affairs were found to be in splendid shape and the reports on the condition of the mine were all most encouraging.——The recently organized Park City Mining & Power Co., of which S. W. Platt is president and T. H. Paull secretary, now has a force of five men employed at its property in Big Cottonwood. Besides owning a tract of the most favorably situated ground in the district, the Company has secured the State water-rights on the stream there, and the water is used as motive power at the mine. With the aid of power-drills excellent progress is being made in the adit.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—Coke is beginning to come into this district after a shortage for several weeks. No fuel is being received from Fernie, but shipments are expected from that point in about ten days. The Granby Co. has received several thousand tons of stock coke from Michel, and again has seven furnaces glowing at the smelter. The weekly shipments from the Phoenix mines to Grand Forks have lately fallen as low as 13,700 tons, caused by the coke shortage, which resulted in the Granby mines closing down on Saturday and Sunday of the last few weeks. Ore shipments, however, will soon be increased to 3000 tons per day, now that seven furnaces are in operation. The dismantled furnace is being lengthened 4 ft. 4 in., which will make its length when finished 22 ft. This work will take three weeks. Each of the furnaces will be altered in this manner, which will increase the capacity of the smelter from 3500 to 4500 tons per day.——The B. C. Copper Co. was but little affected by the Fernie disaster, as this Company obtains its coke from Coleman, Alberta; hence, it has been able to maintain steady operation.——Mining at the Brooklyn and Rawhide mines of the Dominion Copper Co. has been resumed after a shutdown of several weeks. The large furnace at the Boundary Falls smelter will be blown in within the next few days.——The Consolidated M. & S. Co. of Canada has started shipping from the Snowshoe mine to the Trail smelter. About 400 tons of ore per day is being shipped at present. Only enough ore for fluxing purposes will be shipped from the Snowshoe while copper remains at its present low figure. Active development work is now being carried on on the Snowshoe and War Eagle holdings of the Consolidated, at Phoenix, and ore will be blocked out preparatory to heavy shipments as soon as the market will warrant it.——Local stockholders in the Granby Co. were disappointed to learn that the directors of the Granby, in convention at Boston, had taken no action on the question of a quarterly dividend. It is understood that the Company is making some profit on its operation, but it is presumed that the directors in passing the question of a division of profits are acting in the best interests of the concern, and the still unsettled condition of financial affairs somewhat reconciles the situation.——Charles Camsell, Dominion Geologist, has returned from a visit to the Similkameen country. Topographical work is now being carried on in the Upper Tulamaen platinum-bearing zone. This district is rich in mineral and will come rapidly to the front as soon as railways are built through it.——The Centre Star, Le Roi, and Le Roi No. 2, Ltd., of Rossland, are keeping up to their regular hipping standard and the ore at depth in these mines is coming in more plentiful as development proceeds.

The following table shows the different mines that shipped lead ore to the Trail smelter during the month of July and is doubly interesting from the fact that it shows approximately what these different mines are shipping to Trail each month and the lead content of their ores:

Mine.	Net weight, Lb.	Lead content, Lb.
Arlington	228,204	5,775
Alpha	39,939	15,650
Blue Bird	29,106	1,863
Blue Bell	809,294	489,722
Curlew	13,479	566
Empress	2,138	17
Ferguson	170,015	47,260
Giant	35,564	24,118
Keystone	15,283	397
Little Robert	1,040	172
No. 1	27,432	823
Reco	81,162	33,982
North Star	1,408,949	290,298
Ruth	152,676	50,948
Sally	38,350	2,148
Slocan Star	46,586	17,796
Rambler Cariboo	122,396	52,980
Richmond Eureka	347,425	70,190
Sunset	163,407	110,274
Silver Glance	9,648	96
St. Eugene	4,622,696	2,657,835
Standard	372,769	241,730
Whitewater	577,963	260,668
Whitewater Deep	88,507	40,495
Westmount	86,758	6,770
Total	9,480,798	4,422,732

Rossland, September 12.

YUKON TERRITORY.

(Special Correspondence).—During the past three years there has been a great deal of agitation and no end of endeavor on the part of the people of this Territory to have several large concessions cancelled, the chief among these being the Anderson, on the lower end of Hunker creek, covering about three miles of the creek bed and hillsides; and the Bronson & Ray, on the lower end of Bonanza creek. The fight was made on these two concessions on the ground that the owners had not lived up to the requirements of their lease, which made it compulsory for them to install either a hydraulic plant, or some other equally efficient method. Neither of these concessions have installed the kind of plant that the people of this camp think cover the requirements of their lease, and it was thought that it had been clearly proven that the contention of the people was correct; however, a decision has lately come down from the Supreme Court of Canada affirming the title of the concession owners, and so far as can be seen now the case is at an end. The public naturally feels a good deal crestfallen at its defeat, nevertheless it has had the effect of convincing a great many people that whatever the Canadian Government gives, is not to be lightly taken away, and in this way has done a lot of good, by showing that after all there is security of title in the Yukon, a condition which unfortunately has often been disputed. It is generally understood that both of these concessions, which are most valuable, have become part of the immense holdings of the Yukon Gold Co., who have already a 7-ft. Bucyrus dredge installed and at work on the Anderson concession, and are now preparing to carry on hydraulicking on a very large scale on the Bronson & Ray next season.

Dawson, August 30.

Special Correspondence.

NEW YORK.

Mexican Mining Law Revision.— Report of American Smelting & Refining Co.— Is the Standard Oil in Control? — Money Available for Company Flotation.

In talking with George W. Bryant, of Guanajuato, with reference to the feeling there regarding the Mexican situation, he stated that the proposed mining legislation has caused little disquiet, as everyone was satisfied that it would never come into effect. The chief objection to the law lies in the fact that the Mexican Corporation Law, which everyone wishing to obtain properties under the new law would have to adhere to, is loosely drawn and contains several objectionable provisions. A clause which would prove troublesome provides that 10% of the capital stock must be paid in before incorporation. This would tend to produce companies with a nominal capitalization far too small for efficient operation. But the Mexican Government, with its usual fairness, will undoubtedly listen to the protests the proposed laws have aroused, and foreigners may rely on receiving generous treatment combined with such regulation as is necessary to exclude only the undesirable element. Mr. Bryant reports the Pinguico mine to have made a net profit in August of $110,000, U. S. currency, from 6400 tons of ore, and the Peregrina a profit of $50,000, in the same period.

The annual report of the American Smelting & Refining Co. has caused a good deal of comment. The list of stockholders of record on August 1 contains four members of the Guggenheim family, with a total of 570 shares, while Daniel Guggenheim has only one share of preferred stock. H. H. Rogers and the Rockefellers are conspicuous by their absence, but the largest individual shareholder is Theodore Freeman, with 20,900 shares, who is associated with B. L. Smythe & Co., a firm which does a good deal of business for the Standard Oil interests. As the stock is evidently held in the names of dummies, it is impossible to tell just how matters stand. It is said that John D. Rockefeller purchased large blocks of the stock during the panic, and has unloaded at a big profit since; and on August 7 that the Guggenheims had regained control by the purchase of 60,000 shares at $88 per share. As the president of the Standard Oil Co. takes little speculative interest in the market, it is possible that the frenzied finance in 'Smelters' which accompanied the advertising campaign from Boston may have caused him to close out his holdings, even apart from the high prices. Anyway, Smelters has lost its reputation as a conservative investment on account of the methods used to exploit it in the market. An interesting question is whether the Guggenheims got out, and if so, if Lawson got out with them. While a house that acted as his agent in the Yukon campaign had large holdings on August 1, the stock advanced from 90 to 107 since then, and it is believed he unloaded upon the long-suffering public which is ever ready to 'hold the bag.'

A certain amount of friction between the Guggenheims and the old Smelters crowd has been revealed, and it is posible that the control may be wrested from the present management. President Daniel Guggenheim in his report said: "After deducting on account of betterments and ordinary repairs the sum of $933,129, the net earnings for the past year have amounted to $7,633,286. There was deducted from the net earnings of the preceding year $540,419 on account of employees' profit-sharing fund, and $1,054,966 on account of new construction and improvements, or a total of $1,595,416, whereas during the past year there has been no payment made to the employees' profit-sharing fund, and the amount deducted for improvements and new construction has amounted to $622,096. The net amount applicable to the payment of dividends shows a reduction, as compared with the preceding year, of $2,903,062. Together with most commercial enterprises in this country, our company has suffered as to earnings. The simultaneous and sudden decline in the value of lead, silver, and copper, together with no proportionate decline in the expenses of operating mines, notably in freights, supplies, and labor, made it unprofitable for many of the mines under contract to the company to continue their usual output of ore. This had the necessary and inevitable result of bringing about the reduction as shown. The large surplus already accumulated, however, was not impaired, and now amounts to a total of $13,408,218."

The directors thought it best to reduce the dividend on the common stock for the last quarter of the fiscal year to 1%, thus bringing the dividend payments within the net profit of the year, even after charging off against profit and loss the entire amount expended during the year for improvements and new construction. There has been completed and added to the property of the company during the past year a lead and copper smelting plant at Chihuahua, Mexico, which commenced operation in July, 1908. The entire cost of the construction of this plant has been charged to profit and loss, as has been the universal custom of the company in connection with new construction for the past five years. There is a marked improvement, at the present writing, in the market-value of copper and lead. The directors feel warranted, therefore, in expecting that the net earnings of the Securities Company for the coming year will not make necessary any further encroachments upon the surplus, and it is not expected that the company will be called upon to make any payments under its guarantee of dividends on Securities B preferred stock.

FAIRBANKS, ALASKA.

Stampede up Innoko River. — Profitable Developments. — Costs of Supplies.—Discoveries in Hot Springs District.—Construction of Important Ditch-line.— Conditions in Fairbanks District. — Rich Drift Mines.

The latest news from Innoko is brought by Dr. W. H. Brown, of Chena. There was a big stampede up the Innoko river this summer, but most of the prospectors are returning disappointed. Nevertheless, the outlook is not wholly unfavorable. Seven or eight claims are in pay gravel, and from 10 to 15 claims promise to be productive. One of the most successful is F. H. Coulmbe, an experienced French-Canadian prospector, who has been in Alaska since 1899, and who went up the Innoko in 1906. He staked No. 4 bench claim on French hill above Gaines creek, and other claims on Glacier and Spaulding creeks; No. 4 bench claim has yielded $20,000, and he sold his one-third interest for $8000. He has gone to his home at St. Thomas, in Quebec, with $11,000 in his 'poke'. Others will clean up good stakes, but nothing very big. Operations have been hindered by the high prices of supplies; for instance, flour has been selling for 35 cents per pound and bacon at 75c. per lb. The country is accessible with difficulty. Everything has to be brought in small boats for 175 miles above the limit of steamboat navigation; the streams are tortuous, and poling has to be aided by 'lining'. As much as $15 per 100 lb. was paid for bringing freight 15 miles up one of the creeks. There is some water for mining on Gaines and Ophir creeks, and two good rains helped, so that about $150,000 will be taken out this season. The ground is frozen, but it is only from 3 to 4 ft. to bedrock in some places, and the maximum depth is 30 ft. The bedrock is a blocky slate. There will be 400 men in the region this winter, but they will be scattered over an area fully 150 miles square.

Another important stampede this season was that to Sullivan creek, in the Hot Springs district, southwest from Rampart. Sullivan creek is on the south slope of Moose Mtn.; pay gravel has also been found on Tufty gulch. The ground is said to yield from $2 to $4 per square foot of bedrock, about 2½ ft. of wash and 1½ ft. of bedrock being extracted. Rich gravel has been struck at 54 and 58 ft. below the surface, and the channel is estimated to be fully 400 ft. wide. One shaft struck bedrock at 103 ft., but on several claims open-cut work is being done on ground only 9 to 10 ft. deep. There is plenty of water for small opera-

tions, and the men returning from the Innoko are coming to Sullivan creek every day.

In the other and older parts of the Hot Springs district, the lack of water has almost put a stop to mining. On Thanksgiving, Glenn, Eureka, and Pioneer creeks the shortage of water will result in a marked shrinkage of gold-production this season. Even copious rain at the end of the summer, now near at hand, could not redress the balance. Lack of water has led to the making of surveys for a ditch line. C. M. Hamshaw, of New York, and M. W. Loveridge, of San Francisco, are making a survey looking to bringing the water of Hootlinana creek to Thanksgiving creek and the other diggings now controlled by Frank G. Manley. This survey includes the construction of a tunnel through a dividing ridge, and as the tunnel must be about a mile long, the cost will be serious, having regard to the quantity of water available, namely, about 1500 miner's inches; but owing to the character of the gravel-deposits even this quantity of water will permit a large production of gold. A Nome newspaper has made the statement that Mr. Hamshaw represents the Guggenheims, and that he has secured an option on Mr. Manley's property on the basis of $10,000,000. This story is being freely circulated, and is entirely without basis of fact. Mr. Hamshaw is in Mr. Manley's employ, and there has been no negotiation with the Guggenheims, who have as much as they can comfortably assimilate. It is true that the extent of the property, and the lack of water, have led Mr. Manley to consider the transfer of a part of his holdings in exchange for working capital, for over $200,000 has been expended by him in preparatory work. Mr. Manley is now on his way to San Francisco and Boston, with a view to obtaining the capital needed to bring the enterprise to a successful issue.

In the Fairbanks district the general shortage of water has been such as to restrict the washing of gravel. On Dome, Vault, and Chatanika creeks, there are many 'dumps' awaiting treatment. Only on Esther creek are operations unhindered, and this is due to three or four large springs which feed the creek even after the winter snows on the divide have disappeared. On No. 8 Below Discovery, Berry & Hamil are opening up a block 640 by 400 ft. by 'drifting' at a depth of 90 ft. The yield averages $1.50 per square foot of bedrock. Self-dumping buckets are used in conjunction with a steam-hoist. On the Reutter fraction, next to No. 3 Below, John Jesson is opening his ground at a depth of 88 ft., the gravel being partly on the creek bed and partly on a bench, following the right limit. The pay is 3 to 8 ft. thick, and yields $2.75 per square foot of bedrock. About 5 ft. of gravel and soft bedrock are extracted by 'drifting' in the usual way. At the other end of Esther creek, Dr. W. F. Green is doing a little prospecting on No. 6 Above.

On Cleary, the Discovery claim, being worked on a 50% lay by D. G. Aitken and John Webster, has been yielding splendidly. The last two clean-ups were $14,700 and $19,000, respectively, for two successive runs of four days each. John C. Smith is working the bench claim on Discovery. Henry Riley is working 30 men on No. 11 Below, and is getting good results by drifting at 70 ft. On Goldstream, each shaft sunk is proving the further extension of the 'pay.' On 17 Below good pay has been struck at 80 ft. There is reason to believe that this part of the Fairbanks district will undergo important development.

JOHANNESBURG, TRANSVAAL.

Aurora West Re-starts Milling. — Gold Output for July. — The Deep Level Developments. — Shaft-Sinking Problem. — Underground Apprentices.—Engineering Students.—Base Metals.

The re-starting of milling operations by the Aurora West, in the poorer part of the Roodepoort district, is one of the most satisfactory items of the Rand's current mining news. This mine has, by reason of its comparative poverty, had a checkered career. It commenced milling in 1892, closed down in 1894, re-commenced in 1899, and again closed down upon the outbreak of war. Upon the introduction of Chinese labor, work was resumed, but in 1905 another stoppage was found necessary. Now that operations are proceeding again, under conditions promising no cause for further check, another steady contributor may be counted upon in the growing list of Rand producers. Its activity foreshadows the opening of a new era of prosperity for a neglected region.

The gold output for July has been declared, and by surpassing the December aggregate set a new record. With 8975 stamps in operation, a yield of 584,455 oz., valued at £2,482,608, has been recorded, of which the Witwatersrand accounts for £2,387,175. Sixty-three Rand mines appear on the producing list, including as one corporation the East Rand Proprietary, which declared the vast total output of £213,852. Profits appear to show a slight increase, the total for the Eckstein properties amounting to £419,331, the Gold Fields group £160,147, and the Farrar group £121,086. This record output, together with an improving market, has given the outlook a brighter aspect.

In a stimulating and rationally conservative speech in the House last week, the Minister of Mines drew special attention to the interesting stage in which Rand deep-level mining now stands, owing to the preparations for production by three new properties, and the exploratory work of a critically significant character proceeding in others which are still in the developing period. The Cinderella Deep (with workings below 4000 ft.) will be ready to crush ore with 50 stamps and two tube-mills in September, having 289,000 tons of $10 ore developed; the Jupiter and Simmer Deep mines, with 592,000 and 500,000 tons developed, respectively, has the joint mill of 300 stamps, briefly described in these columns a month ago, practically completed, and the Rand Collieries, Van Dyk, Geduld, City Deep, and Brakpan mines, in various stages of development, reveal the payability of extensive areas previously known only by bore-hole tests or through the showing of development-work in distant mines.

Technical men on the Rand, notably those engaged in deep-shafting, or Government officials concerned in the safety of operations, have raised a call for information which it is to be hoped will receive response from those in the United States who have had the necessary special experience. A problem has to be faced which, it appears, cannot be satisfactorily solved on theoretical lines, while the evidence available on the Rand is too contradictory to enable conclusive explanations to be advanced empirically. It has been found that in the sinking of deep vertical shafts with buckets there is a critical danger-point, at the depth of 300 ft., with remarkable constancy, where there is a liability to abnormal swing bringing the bucket against the timbering, with serious results, whether filled with ore, men, or rock. This irregularity, which occurs without manifest cause perhaps once in several thousand hoists of practically perfect steadiness, only occurs on the upward journey. To it must be attributed considerable loss of life. Girdler Brown, who sank the Cinderella Deep shaft 4000 ft., experienced this trouble on three occasions within a few months. He attributes the phenomenon to uneven loading, to not taking the bucket close to the cross-head before accelerating, and to irregularities in engine driving, setting up sagging in the rope. At a meeting of the South African Association of Engineers (an organization which is dispelling the charges of dormancy laid against it by its recent consideration of essentially practical and important mining problems), a number of able engineers of high practical scientific attainments discussed the question, but it only led to a revelation of greater complexities. E. J. Laschinger, the Association's new president, tentatively advanced the suggestion that the occasional swing to the timbers might be due to a combination of three factors, the pulsation of the rope, the slight pendulum swing, and the normally insignificant 'kick' of the first-motion engine employed. The law of averages would, upon rare occasions, lead to an exact synchronizing of these impulses, which may be responsible for the disastrous results noted. J. A. Vaughan, of the Mines Department, before whose notice all these accidents, if reported, must come, did not support the

view that the engine was a factor of importance, and expressed the hope, in view of the contradictory character of the data collected, that the discussion of the matter would lead to the publication of experiences recorded by deep-shaft sinkers in other parts of the world. The discussion of this special feature of deep-shaft sinking has again raised the old question of the relative merits of sinking with buckets or with skips, the latter making for speed and the former for safety. The question is not one which lends itself to analysis on purely engineering grounds. The Brakpan and Cinderella Deep shafts were sunk with buckets, but in the Turf mines, now approaching 3000 ft., skips are being used, as was the case in the City Deep and Wolhuter Deep.

The French Rand has been obliged to declare a loss of nearly £2000 on operations for July. It is announced that in future the policy of the company will be changed, owing to the troubles encountered underground, and attention will be devoted primarily to the narrow, but rich, South Reef. This will involve a temporary curtailment of milling operations. A report on the mine's position is promised, but the growing percentage of unpayable Main Reef demonstrated in published records, points to the cause of the altered mining policy.

The demand for the thorough training of skilled men to serve the industry has led to the formulation of a more elaborate scheme of underground apprenticeship than hitherto attempted, which, in theory at least, promises well. Limited success, it is true, has attended efforts in the past to provide sound practical education on these lines, principally for the reason that opportunities, remuneratively more attractive, have been too plentiful to encourage youths to follow a severe course of general training. As the field gradually resolves itself into a gold-manufacturing industry, with an efficiency too high to allow the inexperienced to slip into positions of responsibility, the apprenticeship system must become, if not more popular, at least a more promising road to success. A three years' term of underground work is prescribed for youths of not under 18 years of age, and a scale of wages increasing half-yearly from 5s. to 10s., or 12s., per shift. The course is to include training in timber-work, pipe and plate-laying, hand-drilling, machine-drilling, shaft-work, pump-work, and general mine duties. Such a range of application reveals at once the cause of former failures. The youth entering the mine under ordinary conditions applies himself to one branch of work, and thus gains proficiency and the skilled man's wage far more speedily than when he is called upon to be experienced in many departments. In other words, the temptation to immediate profit outweighs the prospects of future promotion to higher positions, in which a narrow experience is of small service.

By his vigorous plea on behalf of the South African trained mining engineer, Prof. Orr of the Transvaal University College, has raised a storm of protests which cannot be readily calmed without the aid of neutral peacemakers. The professor's plea was livened by a bold attack upon the scheme whereby a few students of the Royal School of Mines, London, are placed on the mines at £10 per month, by way of a post-graduate course; students of the local college, he declared, were not given these special facilities. The committee of the Institution of Mining & Metallurgy responsible for this working of the post-graduate scheme has risen up in arms against Prof. Orr's 'intemperate' attack, and it seems that a warm controversy must follow, of little advantage to the cause either of the London or of the Johannesburg students. Different consulting engineers and managers naturally have different ideas as to the best field from which to draw recruits, and it is unlikely that any biased arguments will affect these predispositions, whatever the benefits of a protectice policy.

The statistics of mineral production for June, issued by the Government Mining Engineer's Department, include a record of results for the half-year. The yield of gold, approximately as declared by the Chamber of Mines, stands at a value of £14,456,652; of silver (from gold bullion), £41,871; and of diamonds, 1,018,155 carats, worth £834,615.

TORONTO, CANADA.

Activity in Cobalt Stocks.—Distinguished Visitors.— Excursion to the La Rose Mine. — Silver Queen. — Iron Furnace Closed at Port Arthur.—Algoma Steel Works Resumes.

On the stock market there has been an enormous volume of transactions in the leading Cobalt stocks, with a strong upward tendency. Never before has Cobalt had so many visitors of distinction as during the last few days. The excursion party of the Canadian Mining Institute, including British, German, French, and Belgian engineers, had a revelation as to the remarkable progress and resources of the camp. At the Crown Reserve mine they were given a spectacular display consisting of a pyramid of high-grade ore of about 35 tons weight, averaging 10,000 oz. silver per ton. One mass of 450 lb. went as high as 20,000 oz. On September 6 sixty New York and Boston brokers came to Cobalt as the guests of the La Rose Consolidated, and inspected the La Rose, Nipissing, Crown Reserve, and other leading properties. The immediate result of their visit was the pouring in of orders, and a sharp advance in prices. The principal demand was for Crown Reserve, which rose from $1.25 to $1.85, and later touched $2, though these high figures were not maintained. The latest development is a sharp advance in Foster, an old favorite, but lately under a cloud, which has been selling for some time between 40 and 50c., and today, on the strength of heavy orders from Cobalt, suddenly advanced to 68 cents.

Heavy shipments from the camp justify the confidence which is felt in Cobalt's future. The total tonnage for the week ending September 5 was 653 tons, from the following mines: Buffalo, 32; Chambers-Ferland, 30; Drummond, 151; Kerr Lake, 41; La Rose, 127; Nipissing, 93; Nova Scotia, 20; O'Brien, 94; Tretheway, 60. The Chambers-Ferland is a new shipper. Rich ore has been encountered in the No. 25 vein of the Nipissing, which at 60 ft. is 5 in. wide, and heavily 'shot' with silver. On the Right of Way at a distance of 9 ft. from the shaft a 2-in. vein has been found from which slabs of silver have been taken out. Another narrow vein was reached at 14 ft. which shows native silver. The new air-compressor plant at Crown Reserve is completed and the big vein is showing up well. The ore blocked out between the two shafts, distant less than 300 ft., is estimated at $3,000,000. The Silver Queen has put its full plant, including the air-compressor, into operation for the first time since the fire some weeks ago, increasing the number of drills from three to seven. The smelter constructed at Trout lake, near North bay, for the treatment of Cobalt ore, upon which $500,000 was expended, has passed into the hands of a syndicate of Detroit capitalists and is now ready to receive ore.

The Atikokan Iron Co., formed to operate blast-furnaces at Port Arthur, Ontario, with a capital of $1,000,000, has gone into liquidation. The plant has been closed for some time. The order for winding up was granted on the petition of Mackenzie, Mann & Co., of Toronto, who are heavily interested in the enterprise, to avoid the sale of the property under judgments obtained by creditors. The Algoma Steel Works, at Sault Ste. Marie, which have been closed owing to lack of orders, will at once re-open. Several heavy orders for steel rails have been received.

MEXICO.

Increased Ore-Shipments.—San Toy Mining Co.— Affairs of Encinillas Mines & Smelting Works.—Chihuahua Plant of A. S. & R. Co. —Mina Vieja.—Santa Eulalia Aerial Tramway.—Lead and Copper at Terrazas.

That the general conditions at the mines, at least in and about Chihuahua, are improving seems indicated from the fact that the ore shipped to smelter through Chihuahua during the month of June amounted to 7500 metric tons; in July, 11,100, and in August, 15,300. But few months last year exceeded this tonnage. The greater part of the ore

going through Chihuahua comes from Santa Eulalia, and there was scarcely a shipper in that district who did not increase production during August, with perhaps the exception of the San Toy Mining Co. That Company has been shipping 2400 metric tons per month, as compared with over 3000 tons previous to the May shipments; but the improvement in grade has more than made up for the shortage in production. The reported deal of this Company for the immense holdings of the Potosí Mining Co., which was said to involve $8,000,000 gold, does not as yet seem to have been consummated, though it is said to be still pending. It is understood that Donald B. Gillies, president and general manager of the San Toy, has bought, through S. G. Burn and R. J. de Morambert, for $345,000, the Florencia mine, in Santa Eulalia, owned by Enrique C. Creel, Governor of Chihuahua and Mexican Ambassador to the United States. That the transfer has actually been made cannot be verified. The Florencia has been held under option for some time by Messrs. Burn and Morambert, who, after developing a fine body of lead ore, had endeavored to sell it to the Encinillas Mines & Smelting Works, of Santa Rosalía (the re-organized Encinillas Mines, Ltd.), of which Mr. Morambert was then manager. The Encinillas came into prominence several years ago, largely because of the great amount of money spent, and the difficulties between the English and French holders. A year ago the Company was re-organized and the control turned over to J. Clarac for the French stockholders, who had charged irregularities in management. Mr. Clarac came to Chihuahua, secured R. J. de Morambert, a former agent of the American Smelting & Refining Co., as manager, and a new plant was promised. Mr. Morambert has now been replaced by J. L. Saint Dizier, for many years assistant superintendent of the San Luis Potosí smelter for R. S. Towne. No new development, however, has taken place. The impression prevails that the chief French holders are afraid to put up their own money and are endeavoring to raise by the sale of stock sufficient capital to start up and make shipments of bullion abroad, to produce a favorable showing.

The Chihuahua plant of the American Smelting & Refining Co. is situated at Morse station, about six miles southeast of Chihuahua. It is now making regular shipments of bullion to New York. The yards are practically filled with ore, and a third furnace will be blown in before the end of September. This Company is shipping from Santa Eulalia an excellent grade of ore to the Chihuahua plant, and also to El Paso. The greater part of the ore comes from the Mina Vieja. The iron-work for the aerial tramway from the Mina Vieja (with branches to Velardeña and Santo Domingo) to the railroad at Santa Eulalia, a distance of about two miles, has been made by the Trenton Iron Works, of Trenton, N. J. The first carload has been shipped, so that immediately upon arrival in Chihuahua the construction of the tramway will be started.

At Terrazas, about twenty miles north of Chihuahua on the Mexican Central, the San Rafael, owned by Corrigan and McKinney, of Cleveland, Ohio, is proving to be a large body of lead ore, and the Columbia, recently taken under lease by the same people, is showing up as a fine copper property. Corrigan and McKinney are negotiating with the Messrs. Creel, of Chihuahua, for the purchase of the Rio Tinto smelter (and possibly the mine also) at Terrazas, in order that they may smelt their own ores, which are almost self-fluxing. The Rio Tinto mines and smelter were taken under option last year, just before the drop in copper, by Martin J. Condon and associates, of New York, and a considerable preliminary payment made, but this spring it reverted to the former owners, namely, Governor Creel and associates.

TERLINGUA, TEXAS.

Production of Quicksilver.—Chisos Mining Co.—New Plant Installed.—New Almaden Mines.—Extent of the Cinnabar District.—General Conditions for Work.

The production of quicksilver in the Terlingua district is constantly increasing. The first cinnabar discovery here was made about twelve years ago by a party of Mexicans who had crossed over from Mexico to hunt deer in the mountains. In the party were men who had had experience in mining. They were quick to recognize the cinnabar. They reported their discovery to two men named Wandless and Mendez, in Mexico. These men, in connection with Charles Allen and another named Case, organized a company and purchased two sections of land upon which the cinnabar prospects were situated. They did some development and sold the claims to James Norman, representing the Marfa & Mariposa Mining Co., for $128,000. This Company purchased additional claims, and developed the properties on an extensive scale. It erected two 20-ton furnaces, and for five or six years its net production of quicksilver amounted to $15,000 to $20,000 per month. Altogether it is said to have produced more than $800,000 worth of quicksilver since the mine was opened. As many as 300 men have been employed upon the property at one time. The mine is still being worked, but with a decreased force. The Marfa & Mariposa mine is situated about nine miles west of the Chisos mine. The workings have reached a depth of about 500 feet.

H. E. Perry, of Chicago, owns what is said to be one of the most valuable quicksilver mines in the district. During the few years that it has been operated, quicksilver to the value of $5000 per month has been extracted from a 10-ton furnace. In the beginning, retorts were used, and even by that primitive method the profits were large. The mine is

Quicksilver District, Terlingua, Texas.

operated under the name of the Chisos Mining Co., but it is stated that practically all the stock is held by Mr. Perry. The Chisos mine proved to be the richest and most productive mine in the Terlingua district. The ore is unlike that in the other developed cinnabar mines, in that it contains no free mercury. The ore is rich, some of it yielding as high as 30 to 40% of the metal. The average, however, is from 3 to 6%. But one shaft has been sunk, which is down 400 feet.

The Chisos mine is said to be superior in richness and productiveness to the New Almadan quicksilver mines of California. In order to increase the output of the mine, preparations are now being made to extend the shaft to a depth of 1000 ft. A new 20-ton furnace has been installed, and an ore-crusher of modern type will soon be placed in operation. One ton of ore will yield about one flask of quicksilver, worth about $45. The expenses of operating the mine are at present about $3000 per month.

Situated on the east side of Terlingua creek is the cinnabar property of the New Almadan Mining Co., which was financed in Dallas, Texas. This Company has invested about $300,000 in the erection of furnaces and in development work. It is now having trouble with water in its lower workings.

The cinnabar mines of the Terlingua Mining Co. adjoin that of the Marfa & Mariposa Mining Co. on the east and north. This property produced quicksilver in considerable quantities for a time, but is not now being worked. The property of the Terlingua Co. was one of the first to be developed in the district. It was largely due to the energy and persistence of I. W. Dewees of that Company that the richness of the district was finally brought to the attention of outside investors. He installed a 40-ton furnace, which did not, however, fulfil the claim made for it in the matter of treating low-grade ore, and the mines of the Company

were shut down. The cinnabar property of the Big Bend Mining Co. is also situated on the east side of Terlingua creek. The Company installed a 20-ton furnace and had begun development work about three years ago, when its president, Will Study, died. His death caused an interruption of the plans of the Company, and the furnace has never been placed in operation. The Company has a great quantity of rich ore on the dump, and is said to own a valuable property. The Colquitt-Tignor Mining Co.'s claims are situated six miles northwest of the Chisos mine. This Company has a 10-ton smelter, and a large amount of ore on the dump. It ceased operations some months ago, but it is reported that it will start work again soon. The Lone Star Mining Co. is erecting a furnace, but is doing no development work at present. Adjoining the Chisos property are promising claims which were originally owned by the McKinney Bros. They passed into the hands of J. R. Holland, of Alpine, who recently sold them to the Chisos Mining Co. for $15,000. It is reported that they will be developed on an extensive scale.

In addition to the claims upon which development work has been done there are a number of good cinnabar properties in the Terlingua district which are lying idle. The mineral has been discovered on the east side of the Chisos mountains, about 65 miles from the nearest mine in the Terlingua district. The remoteness of the region causes development work to progress slowly. The State of Texas owns every alternate section of land in the mining district, and the mining law is so unfavorable to prospecting upon State lands that the work is wholly confined to the land held by private ownership.

The water and fuel problem is a serious difficulty. The water-supply for some of the mines has to be hauled from the Rio Grande, a distance of several miles, while wood is brought over from Mexico by Mexican wood-haulers. A good quality of coal is found in some parts of the district, which is mixed with wood and used for fuel in some of the furnaces. Some of the concerns have steam-plants, while others use gasoline. Alpine is the most accessible railroad shipping point for the mines. It is situated 100 miles north of Terlingua. The road is fairly good, but in case of rains it takes teams from six to eight days to make the trip one way. There is no stage-line to the district, and visitors have to get in and out the best way they can. The building of a railroad from a rich lead and silver district situated in the mountains of Mexico about thirty miles south of Terlingua, through the Terlingua district, to a connection with the Southern Pacific railroad at Alpine, Texas, is now proposed. Enrique C. Creel, of Chihuahua, Mexican Ambassador to the United States, is the principal owner of the mines in the Mexican district referred to, and is backing the proposed railroad.

BUTTE, MONTANA.

Miners' Union Takes Conservative Position.— North Butte Extension. —Butte Coalition Developments.—Raven Mining Co.'s Directorate.—New Work by North Butte Company.

The Miners' Union of Butte again demonstrated its good sense and conservatism when its members, by a referendum vote, decided not to take part in the troubles of the Amalgamated employees in the lumber mills at Hamilton and St. Regis. At the time the wages of the miners and other employees of the Amalgamated Co. were raised, a year or more ago, the wages of the lumbermen were included. When the financial panic came on the miners accepted a reduction in wages to the old scale. Some of the lumber workers did likewise, but those at the Hamilton and St. Regis refused. The strikers appealed to the Miners' Union to take up the fight and refuse to handle lumber, from any source, in the Butte mines until the demands of the striking lumbermen were adjusted.

There are prospects that work will shortly be resumed by the North Butte Extension Copper Mining Co. A. M. Andrews, treasurer of the Company, has been in Butte for several weeks trying to reach an agreement with those who have claims against the Company. It is asserted that the New York end took from the treasury thousands of dollars for office expenses. The Extension Co. has some excellently situated property, and there is a fine vein showing in the development shaft, which is now at a depth of 700 feet.

The Butte Coalition Co. will at once sink the Rarus shaft to the 2000-ft. level. The 1800-ft. level has just been opened. The Company is also opening the 1300, 1400, and 1500-ft. levels of the Minnie Healey mine, these levels being driven from the Tramway shaft. They will have no connection with the old Minnie Healey shaft or with the upper levels where the poisonous gases from the mine fires have interfered with mining for some time.

At a postponed meeting of the stockholders of the Raven Mining Co. in Butte a few days ago the following directors were elected: E. C. Frisbie, Robert A. Griffing, and E. J. F. Rea, of Hartford, Conn.; E. A. Slack, of Brookline, Mass.; A. B. Curtis, of Boston, and John Berkin and Donald Campbell, of Butte. It was announced that the Company would continue work on the Raven claim, and that the incline shaft would be sunk from its present depth of 1100 to the 1500-ft. point. The shaft will be straightened to a vertical. A winze has been sunk on the larger of two veins at the 1100-ft. level, and it will be connected by crosscut with the shaft at the 1200.

The North Butte Co. is installing new boilers aggregating 500 hp. at the Speculator shaft, and it is claimed they will make a larger daily tonnage possible. The Company is now hoisting between 1400 and 1500 tons per day, and the claim is made that the copper production is at the rate of 50,000,000 lb. per year

SALT LAKE, UTAH.

Dividends Payable by Silver King Coalition. —Bullion Settlements.— Utah Copper Co.'s Improvements. — Washington County Oil Field.—Majestic Smelter in Beaver County.

The Silver King Coalition Mines Co. has come into the limelight again through its return to the dividend list. A distribution of 50c. per share, or $187,500, will be made on October 1 to shareholders of record on September 20. The Silver King properties are at Park City, embracing over 2000 acres. A vigorous campaign of development has resulted in increasing the available tonnage of ore and the property is said to be in better physical condition than ever. Dividends are now expected quarterly. The ore and bullion settlements reported through Salt Lake banks last week aggregate $425,000, and the sales on the Salt Lake Stock & Mining Exchange amounted to 349,017 shares, representing $297,607.

The Utah Copper Co. is acquiring surface rights to adjacent territory to be utilized as a dumping place for overburden removed from the porphyry-ore deposits, and to make room for additional trackage. For $17,500 the right to use 29 acres for the purpose stated has been acquired from the Little Eddy and the Puritan Gold & Copper companies, which followed a purchase made recently from the Bingham Amalgamated Copper Co. The right of way for the proposed extension of the Bingham & Garfield railroad, a subsidiary corporation to the Utah Copper Co., will cross the ground acquired.

During the past year much attention has been paid to the opening of a new oil district in the eastern portion of Washington county near Virgin City. A half dozen producing wells have been brought in, and an Eastern syndicate has secured a foothold and will install many new rigs before the close of the year. The oil is a high-grade lubricant.

Rumors have been persistent this week that the smelter owned by the Majestic Copper Mines Co., near Milford, is to be placed in commission soon. The plant is equipped with one copper furnace and one lead stack. The original promoters of tne Majestic built the smelter to help boom the stock which sold at fancy prices. There is enough ore developed in Beaver county now to keep even a larger plant than this one busy, and Pioche, Nevada, could contribute a large daily tonnage.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Tailing is the property of the person from whose works it issued, if retained on his own land. When allowed to flow upon another's land, the owner of the land is entitled to the tailing, and may even sue for damages.

Metal mining is more injurious to the health of miners than coal mining. The inhalation of coal dust produces pulmonary difficulty in time, but not so promptly as the dust from metal mines. The increase of dust from the use of power-drills has greatly augmented this difficulty.

Water softening, where the hardness is due to lime sulphate, may be accomplished by the addition of barium carbonate. Barium sulphate is produced and lime carbonate forms, both of which are nearly insoluble, and will precipitate. Barium hydrate may also be employed, which has the advantage of decomposing the lime salt with the formation of CaO, which will reduce the soluble lime bi-carbonate to the insoluble carbonate. The high cost of barium salts is an obstacle to its wide use for this purpose.

Refractory brick for lining reverberatory furnaces, lime-kilns, and the like, may be made from bauxite, for which purpose as pure a grade as that used in the manufacture of aluminum is not necessary. To make such brick, wash the bauxite to remove free silica, and then calcine the material thus floated off, at a temperature of 2500°F. Mix the minimum quantity of very pure washed fire-clay needed to effect a 'bond,' mold, dry, and burn in a down-draught kiln at a high temperature. About 3% of hydrated lime may be used for 'bonding' instead of fire-clay.

The largest stone crusher ever built, according to the best advices attainable, is operated by the Dixie Portland Cement Co., at South Pittsburg, Tennessee, and was built by the Power & Mining Machinery Co., Cudahy, Wisconsin. The crusher is 18 ft. 11 in. high and weighs 425,000 lb. Pieces of rock 3 by 5 by 10 ft. can be crushed by this machine to 6-in. size at a rate of 800 tons per hour. The crusher is of the gyratory type, and is positively operated by an eccentric completely submerged in an oil chamber. The crushing-head is 65 in. diam. at the bottom, 6 ft. 9 in. high, and weighs 32,000 lb. The lower shell of the crusher is a single casting and weighs 73,000 lb. The heavy and expensive parts of the machine are protected by renewable steel and white iron liners wherever abrasion takes place.

Lime is frequently used in place of an explosive in coal mining, particularly in Europe. Pure calcium oxide (CaO) ground to a fine powder is made up into a cartridge 3 to 4½ in. long, with a groove ½ in. diam. on one side. An iron tube ½ in. diam. and perforated on the upper side, is inserted the whole length of the bore-hole. This tube is inclosed in a calico bag which covers the perforations and one end of the tube; the other end is fitted with a tap. The cartridges are then pushed to the back of the drill-hole and tamped in the same way as an explosive. A small force-pump is connected with the tap at the end of the tube by means of a short flexible pipe, and water equal in bulk to the quantity of lime used, is forced in. The water escapes through the perforations as it passes along the groove, and the lime in the cartridge is saturated, the tap is closed, steam is generated, and the combination of generating steam and expanding lime brings down the coal.

Feldspar is in demand on the West Coast for the manufacture of porcelain. Prospectors will do well to look out for commercial deposits. These may be found in any granitic region, particularly where pegmatite dikes are frequent. The existence of much free silica, and particularly of basic accessory minerals, such as hornblende, pyroxene, and mica, renders the feldspar unfit for the purposes of the potter. A deposit should be very carefully sampled, knocking off the weathered surface, and taking fresh rock only. As examples of commercial feldspars the following analyses are given:

	No. 1.	No. 2.	No. 3.	No. 4.
	%	%	%	%
SiO_2	64.97	65.85	66.81	68.82
Al_2O_3	20.85	19.42	21.09	19.75
Fe_2O_3	....	0.24	6.13	0.16
K_2O-Na_2O	13.72	14.10	9.64	9.15
CaO	....	0.56	2.03	1.64
MgO	....	0.08	0.10	0.17
H_2O	0.46	....	....	....

Any of these would have a market value, but it may be indicated that in No. 3 the Fe_2O_3 has reached the maximum permissible.

Triangular weirs for the measurement of the flow of water are practical only when the quantity of water is small. The coefficient by which the theoretic discharge must be multiplied to obtain the actual discharge varies less with changes of the head for triangular weirs than for those of the rectangular form. These coefficients have been investigated only for weirs in which the lower vertex is a right angle. The theoretic discharge for such a weir may be computed by the formula:

$$q = 0.533c \sqrt{2g} H^5,$$

in which q is the discharge in cubic feet per second; c is the coefficient of discharge; g is the acceleration of gravity in feet per second; and H is the head, in feet, on the vertex of the weir. As a result of experiments by Thomson, the mean value of c for heads between 0.2 and 0.8 ft. may be taken as 0.592, and hence the mean discharge through a right-angled triangular weir may be written

$$q = 2.53 \sqrt{H^5}.$$

The usual precautions for other forms of weirs must be observed. The inner corners of the weir must be sharp, the contraction of the stream must not be suppressed, there must be no velocity of approach (or else it must be allowed for); and the head, H, must be measured several feet back from the weir.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Methods of Sampling Ore in Place.

The Editor:

Sir—Sampling of mines and prospects, by many mine foremen, and even by some engineers, is not done with sufficient care to reveal the truth as to the value of the ore sampled. There are several inadequate methods in vogue for sampling the face of a drift. Among them I will mention three of the commonest: (1) The grab sample, in taking which the sampler merely picks handfuls of the ore from various parts of the muck-pile resulting from the last shots; (2) the 'hit or miss' sample, in taking which the sampler picks down loose portions of the face here and there until he has filled his sample sack; and (3) the channel sample, in taking which he carefully cleans the face of the drift and, with a moil, chips off a uniform channel across the face, catching all that drops in a canvas spread for the purpose.

If the material sampled is thoroughly homogeneous with respect to the metallic content of the ore, either of these methods will give a sample that, when assayed, will indicate correctly the average quantity of the material in the face. But, unfortunately or otherwise, the material sampled is seldom of a homogeneous nature. If rich streaks of minerals occur, it is evident that a sample taken by any of the above three methods cannot be correct, for the reason that a proper proportion of the rich material will not be included in the sample, thus causing the results to be either too high or too low. A small piece from a streak of bornite rich in silver, or a little too much broken from a 2-in. streak of chalcopyrite, will cause the sample to indicate too high a proportion of silver or copper, while a failure to include a large enough proportion of these rich minerals will cause the sample to run too low.

A much more accurate method of sampling the face of a drift is to take several samples, each one being a sample of one of the various streaks, bunches, or bands of ore, and to calculate the average metallic content of the material in the face from the assay results obtained from the several samples. The face of the drift should first, by careful inspection, be divided into separate bands or streaks, each one approaching a homogeneous condition as near as may be possible. These bands or streaks should then be sampled separately by taking a channel-sample across each streak, and noting the exact width of each sample in inches. After assaying, the average of the ore sampled may be determined, by multiplying the per cent of copper or other metal in either percentages or ounces per ton, by the width in inches of that particular sample, adding the several products, and dividing the result by the sum of the several widths sampled. For instance, supposing a sample to have been taken across a 5-ft. orebody containing three bands of ore of different quality, and supposing the assayer gave results as follows:

	Width sampled.	Silver per ton.
Sample No. 1.....	36 in.	10 oz.
Sample No. 2.....	2 in.	1000 oz.
Sample No. 3.....	22 in.	30 oz.

$$36 \times 10 = 360$$
$$2 \times 1000 = 2000$$
$$22 \times 30 = 660$$
$$60 \qquad 3020$$
$$3020 \div 60 = 50.3$$

This results in an average of 60 in. of 50-oz. ore. If the small 2-in. streak of high-grade ore had been thrown out, the average for 58 in. would have been about 17 oz. per ton, hence obviously unfair to the property sampled. If the whole sample had been taken as one, and twice as large a proportion of the rich 2-in. streak had been included than was proper (it is impossible to get this proportion to approach correctness), the resulting average for the 60 in. would have been about 83 oz. per ton, which is obviously too high a result.

An advantage of using this method of sampling, even when the proportionate richness of the various bands of ore cannot be determined by inspection, is, that after the assay results have been obtained, an idea can be formed, by constructing an assay map, of the form of the ore-shoot, often resulting in the finding of ore of a paying quality where other methods of sampling would have indicated ore of too low a grade to pay.

JOHN H. RICE.

El Paso, Texas, August 5.

Technical Education.

The Editor:

Sir—I was much interested in the editorial on 'Technical Education' in the MINING AND SCIENTIFIC PRESS of June 13, and have since reflected that a reason for the rather general criticism of present-day technical education lies in the fact that it is straddling the fence between two incompatible fields of endeavor. The one is that which you urge should be more adequately covered, which, when it is summed up, is the making of a really educated man; the other is the making of a highly specialized workman. Now which should we have? You cannot make a silk purse out of a sow's ear, and you cannot educate some men. I am thinking at this moment of a man who has his doctor's degree from a well known university, but who is actually less educated than a good horse. Then there are other men who are educated, but who never went to school. Others again could never become specialized workmen; they could never become good assayers; they could barely hold their jobs at running a drill or as shift-boss in a mill; yet they can manage mines, and in general fit the standard of your editorial. We need both types of men, and we can solve the problem very simply by giving two kinds of courses, one in pure technique for the workman type, and a really educational course for the other type. Not one man out of twenty is a competent judge of what he is fitted for when he enters college, and his

parents are usually less able to judge, for they think he is what they want him to be. So each would be taking the other's course, and I fancy the net result would be much the same as now. Is there any better method than giving the undergraduate what he must have, and telling him to get what else he needs for himself? I think personally that certain things that he now has to get for himself had better be included in his course, above all the business side of mining and metallurgy; all our young graduates are deplorably weak in that. On the side of general education, courses in political economy, logic, and psychology are almost equally needed. But when you almost have to use force to get the festive undergraduate to take his courses in calculus and mechanics (since he wants 'practical things'), how shall you make him submit to psychology? 'I interrogate for enquire,' as Hashimura Togo would say.

Certainly our present methods of technical education need tinkering as badly as does the tariff, but I must confess I do not know just how it ought to be done. Why not give it to the new Mining and Metallurgical Society to cut its teeth on? That body ought to be able to fix it, if anybody can.

THOMAS T. READ.

Tientsin, China, July 29.

Montana Mine-Owners' Association.

The Editor:

Sir—I notice in your issue of August 29 that one of your correspondents stated that there seems to be something wrong with the Montana Mine-Owners' Association which was organized to fight the smelter trust. We do not know where your correspondent got his information. The officers of this Association made arrangements with the Idaho Smelter & Refining Co. to work the ores of the Association and any non-members throughout the State of Montana. During the month of August Thos. L. Greenough purchased the interest in the Idaho Smelting & Refining Co. of J. Herbert Anderson. Mr. Greenough is vice-president of this Association, and his company will work our ores on the same terms and under the same agreement as we made previous to his purchasing Mr. Anderson's interest. The officers of the Montana Mine-Owners' Association did not think it was necessary to publish all their acts and doings to the public, as each of the officers has spent his time and money to further the interests of the Association and has gone about the work in a quiet way. Nearly all our members who have ore to ship are forwarding it to the Panhandle smelter, and seem well pleased with the results. The officers of the Association are putting in their time gratis, and we hope to accomplish many other results, but do not care to publish in advance what we expect to do in the future. The Panhandle smelter is now receiving thousands of tons of ore monthly, and will be ready to blow in a plant on or before October 1. We are not out for the purpose of fighting the trust, but for the simple object of getting lower smelter-rates, to give relief to the mine-owners of this State. There is plenty of room for the A. S. & R. Co. to keep its plant going, provided they adjust their rates on an equitable basis, so that the mine-owners can live and make a little money besides. I hope this explanation will give satisfaction to some of your readers.

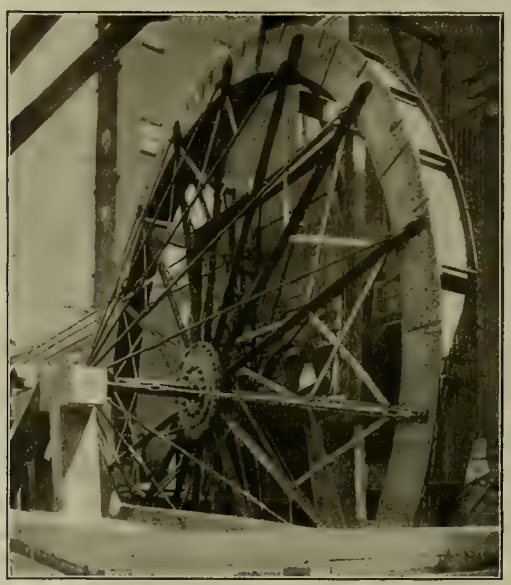
R. A. BELL.

Helena, Montana, September 8.

Tailing Wheels Compared with Centrifugal Pumps.

The Editor:

Sir—The accompanying photograph conveys a good idea of the construction of a tailing wheel, designed and constructed at the works of the Smuggler Union Mining Co., by M. R. Hansen, the master mechanic. It is of the internal-bucket type, and weighs 13,679 lb. It is 24 ft. diam. over all, containing 92 buckets, makes five revolutions per minute, elevating 225 tons of sand and 2775 tons of water each 24 hours, and requires 8 hp. with a full load. The wheel is mounted on a 7-in. shaft, resting



Tailing-Wheel at Smuggler-Union Mill.

on two bearings, 8-ft. centres, and is driven with cog-gears, making two speed reductions, on a counter-shaft which is belted to the vanner line-shaft. The hub is cast in two pieces bolted together, allowing the spokes, made of 3 by 4 by ½-in T-iron, to fit between the two sections of the hub.

The rim is built of two circles of ¼ by 2-in. angle-iron and $^{5}/_{16}$-in. sheet-steel plates, lined with pine lumber, this lining forming a part of the buckets and taking all of the wear from the sand. Each section of the rim is braced with 1¼-in. rods running to the outer ends of the axle. Judging from several years' operation of the old wheel, which was not as well constructed, the repairs, aside from the annual renewal of the buckets, at a cost of $100, will be of no consequence. It seems quite safe to count on at least 10 years as the life of this wheel. For fifteen months prior to this installation, the tailing was pumped with a centrifugal pump. This proved more expensive and very unsatisfactory, owing to the frequent stops for repairs, and the necessity for often changing the speed to get a

regular discharge. The following costs of installing and operating the wheel, as well as the same for pumping, give a comparison which may prove interesting to others as a vindication of the excellence of the tailing-wheel.

WHEEL.	
Iron and steel	$1,050
Gears, etc.	220
All lumber, including patterns	96
Labor	1,435
Designing and superintendence	250
Total cost of contruction	$3,051
Allowing 10% of total cost per annum for amortization, per month	$ 25
Repairs, per month	8
Power, 8 hp., at $6	48
Total per month	$ 81

CENTRIFUGAL PUMPS.	
Three complete pumps, including freight	$ 930
New liners, etc.	220
Labor (installation and repairing)	200
Total for 15 months	$1,350
15 month period; per month	$ 90
25 hp., at $6	150
Total per month	$ 240

WALTER L. REID.

Telluride, Colo., August 26.

Mine Investments and Ore Reserves.

The Editor:

Sir—To be a paying investment a mine should eventually return the capital invested, with interest at a per cent thought to be equal to the risk. While the bank-rate for deposits is 4%, and 8% can be obtained on good securities, 20% is the minimum interest considered safe in mining investments. Properties which are thoroughly developed, with reserves of ore that can be accurately measured, and the profit figured to within a few cents, may not require this high rate. English investors consider 25 to 35% a fair rate on mines in this country.

Gold mining is not more risky than mining for the baser metals, for while subject to irregularity of metallic content, there is no variation in the market price. Gold mining, when conducted on the same lines as mining for coal, copper, or lead, offers as good or better inducements to capital awaiting investment, but the lure of gold often leads good business men into absurd methods of financing and operating. Too often, as long as a mine pays its way, the feat is considered so meritorious that the shareholders' right to expect a dividend is not considered at all.

A mine, to be considered an investment, must return the original money invested, with compound interest, until the mine is exhausted, together with the minimum per cent of interest per annum, which should be 20%. The life of a mine, or the time it is worked until it is exhausted, will depend upon the amount of ore blocked out and that to be developed, divided by the rate at which it is mined. Without considering special cases, this time may be considered as seven years. The mine, then, must pay sufficient dividends to redeem the capital at compound interest in seven years, with interest at the rate of 20%. This redemption or depreciation-fund may be invested by the company and returned when the mine is exhausted, or returned to the shareholders in the form of dividends. There are many objections to the former procedure.

To take a specific case, what should be the amount of dividend from a gold mine treating 75 tons of ore per day, in which $200,000 has been invested, so as to constitute a safe investment, and what profit per ton should be realized? A sum of $200,000 invested in commercial securities will safely net 5%, which at compound interest for seven years will amount to $281,415. To pay back the original investment, $40,200 must be returned each year for seven years. Interest at the rate of 20% will require $40,000, making a total of $80,200 per year. If the mill treats 75 tons per day, in a year of 360 days, it will treat 27,000 tons. The profit of $80,200 per year, divided by 27,000, gives approximately $3 per ton. Should the profit be less, the ore must be sorted more carefully, the extraction in the reduction plant must be raised, the operating expenses reduced, or the plant enlarged. It is safe to assume that the first two contingencies will have been attended to. The operating expenses include mining, milling, superintendence, and development. Of these, only the last will claim attention, for it may be assumed that the other expenses are at their minimum.

Development means reserve ore. All profits from a mine might be put into development, and unfortunately this is often done. The question then is, how much reserve ore should be on hand. By 'reserve ore' I mean that which has been opened up so that it can be measured and sampled on two sides of a triangle, or three sides of a square the sides of which are not longer than the horizontal length of the ore-shoot. The answer to this question will depend upon the character of the deposit, the depth to which it has been developed, and the tonnage of the reduction plant. The deeper the mine is developed the less ore reserves will be necessary, until the mine is exhausted in the hypothetical seven-year period. The mine is then exhausted at the rate of 428 ft. per year. A mill treating 75 tons per day will in one year exhaust 428 ft. of vein along the ore-shoot if the vein be 2 ft. wide and the ore-shoot 410 ft. long.

Half the capital invested will go into development and equipment, for it is a fair assumption that the mine was not bought nor the equipment ordered unless there was blocked out ore that would return a profit of at least $100,000 at, say, $2 per ton profit, or 50,000 tons of ore. The ore in the mine must then have been blocked out to about 800 ft. in depth, yielding sufficient ore to supply the mill for 22 months. By the time this supply has been exhausted the reserves should be developed about 580 ft. deeper, or at 1380 ft. This will give 16 months' reserve. When at 2000 ft., 270 ft. more must be opened up, giving 7 months' reserves. The amount of development necessary to keep ahead of mill-needs is now seen. In the first 22 months the shaft must be sunk 580 ft., and the drifts at this level extended to the limits of the ore-shoot. If the shaft be in or near the ore-shoot,

the work required will be about 30 ft. of shaft, 100 ft. of drifts, and 30 ft. of raises per month. If the mine management is doing more than this, and the mine is not paying as it should, the development may be cut down to this minimum. If the mine cannot afford this, it may be classed as a poor investment, unless by enlarging the plant a sufficient reduction in expenses can be made.

The sooner a mine is exhausted the greater the profits, granting that ore can be provided fast enough. If the capacity of the hypothetical plant is doubled, the mine will be exhausted in 3½ years. Now, $200,000 at compound interest at 5% for 3½ years gives $237,312. This divided by 3½ gives $67,800; plus 20% interest, is $107,800, which must be paid each year in the form of dividends to redeem the capital and pay a fair rate of interest. The only saving attained by doubling the capacity of the plant will be in the running expenses, which may possibly, but not probably, reach one dollar per ton. The reserves necessary may be doubled.

Many pretend to believe that for every ton of ore taken out of a mine two should be developed. As there is a limit to which mining may be profitable, the absurdity of the idea need not be insisted upon. My theory is that as a mine is limited in ore available, the amount necessary to be kept in reserve should diminish from the year when the maximum of safety has been reached. If we start with no ore in reserve, then it should be developed faster than two for one until the point of safety is reached. A mine in the development stage, with no reduction works, will in most cases have a two years' supply of ore on hand. This much is generally required before a mine can be sold, or before a mill is justified, and taking this as a starting point, if the other data are known, the dead work necessary to keep the mine going until exhausted may be figured.

Suppose a mine with a 400-ft. ore-shoot, 5 ft. wide, to be opened up to 1000 ft. in depth along the vein, and that the mill treats 100 tons per day. Suppose the mines in the vicinity have become unprofitable at 4000 ft., or, in lieu of all evidence to the contrary, it is deemed that the pay ore will last to that depth. how much dead-work should be done the next year?

A mill treats a hundred tons per day, or 72,000 tons in two years. This is 938,000 cu. ft. The ore-shoot being 400 ft. long and 5 ft. wide, must be blocked out for 475 ft., so that the ore has been exhausted from the surface to 525 ft. in depth. If the mine is to become exhausted at 4000 ft., and if it be accepted that a safe amount of ore on hand to start with may vary in inverse ratio to the depth, then the following or third year the mine should be developed to 1356 ft. The formula I use is:

$$X = \frac{R(D-d)}{D}$$

where X is the reserve necessary at any given point, R the ore for two years' supply from the starting of the mill, D the depth at which the mine becomes unprofitable, d the depth of the mine at the time the reserve is reckoned.

This mine will have a life of over 20 years, and the capacity of the plant, as well as the reserves, should have been increased. Very few orebodies are so simply constituted as here portrayed, so the amount of development work necessary would vary, and instead of reckoning in feet of depth it would be better to convert to tons of ore. I used the former for convenience. The theory that the reserve should grow less as the limit of profitable working is reached allows for the increased cost of working at greater depths to be taken out of development expenses.

ALGERNON DEL MAR.

South Pasadena, California, September 5.

Professional Ethics.

The Editor:

Sir—In answer to the question asked by 'Constant Reader' in your issue of August 29, Mr. Probert draws the comparison between the engineer disseminating information, obtained while in the employ of a company, which was to the discredit of that company, and the physician making use of previously obtained knowledge in the treatment of a case. Would it not be a closer parallel to compare such an engineer to the doctor who gives out information obtained professionally, which is injurious to the chance of the patient? I dare say such a physician would be in no little demand in delicate cases, as would be the confidential man in business who made public his employer's methods.

There are even closer comparisons to be drawn from the few rules established by custom among mining engineers. A consulting engineer is employed to advise as to the method of treatment of an ore, or on the operation of a mine. The information he obtains regarding that property, and the conclusions he arrives at belong to that company. If it were part of his duty, or even his privilege, to make public any error he might discover in the management, or financing of that company, the demand for professional service would be greatly lessened. It would hardly be professional for an engineer to examine and report on a property for one client, and then to sell his report to a second client. This second client might, as in the case cited by Constant Reader, be going to invest too small an amount to warrant a separate investigation, but that would in no way affect the reporting engineer.

Why should the young engineer, employed by a company, in a subordinate position, be allowed greater latitude than his more eminent confrères? From my own point of view, such an action as that under discussion would be both unprofessional and unbusinesslike. True, it might save the one small investor from a bad investment, but that the mining industry would be benefited thereby I question. It is not through such actions that we may hope for the universal adoption of the open-door policy in mining, but through a realization of the fact that the engineer is working for the best interests of his company in whatever capacity he may be employed, and a recognition by the investing public of the beneficial results from such service.

SUMNER E. BROWN.

San Francisco, September 8.

TREMAIN STEAM STAMPS.

Written for the MINING AND SCIENTIFIC PRESS
By CYRIL E. PARSONS.

In southern Rhodesia more than forty small Tremain steam stamp-mills are in constant operation. They are light, portable, and self-contained, though they consume a large amount of steam, in other words, fuel and water. This is not so serious where the plant is small, fuel cheap, and the available amount of ore limited. In Rhodesia they occupy quite an important position in the gold-mining industry. As soon as the royalty-system of payment was introduced into this territory, numerous small producers appeared as if by magic, and the industry received a great impetus. The majority of the deposits, it must be remembered, are small; the owners could not face a large capital-outlay; in many cases small deposits, containing only a few hundred tons of moderately high-grade ore had to be dealt with; and consequently a demand arose for a small machine which did not cost much.

High railway and transportation rates emphasized the necessity for some portable mill. A barrel of cement, for instance, which at the port of Beira costs 14s. 6d., delivered to the property costs 60s. In other words, third-class goods, which include the majority of ordinary mine stores, cost £12 per ton for railway freight alone.

The Tremain stamp-mills weigh 3300 lb. They consist of two stamps, the upper ends of the stems being two pistons moving in cylinders actuated by steam. To the lower ends of these stems, shoes are attached, each stem and shoe, when new, weighing 300 lb. The machine is worked by steam direct at a pressure of about 110 lb., and the stamps work in a mortar with front and side discharges. At Salisbury, the capital, the whole outfit, comprising a mill, amalgamating-table, and a 10-hp. boiler, can be had for £540, and with another £200 erection and extra expenses can be provided. The entire plant would weigh about eight tons. The foundations are usually inexpensive. The makers recommend a pile 12 ft. long and 30 in. across, but shorter lengths, of 9 ft., answer well, depending a good deal upon the nature of the ground. In one instance a 9-ft. pile was cut out of the trunk of a tree severed above the fork; thus two legs appeared at one end. This end was placed downward in the prepared excavation, with the idea that the splay increased the rigidity of the pile. On the prepared and level face of the pile-block rests the mortar, with an intervening piece of blanket, rubber-insertion, or even buck-hide. The boiler is set on rough foundations, as near the mill as possible, to avoid loss of steam through condensation, and to ensure a constant supply of dry-steam. A small automatic rocker feeder is usually provided. These are easily adjusted, and work well if the ore is clean, but are apt to break and jam with mixed clayey material. A rock-breaker is a distinct advantage, but necessitates a small auxiliary engine, which, in districts where native labor is cheap and plentiful, can be dispensed with. As a substitute, 'niggers' are employed to 'spall' or break the rock to the required size, which is that of a walnut, by hand labor. The mill often has a dilapidated appearance, with a few sheets of old battered second-hand corrugated iron to house it, supported on crooked native wood-poles (for straight timber in that country is unknown). Scantily attired natives may be seen moving leisurely about, while the white man may be underground, at the mill, or in his hut close by, snatching a few hours' rest.

Accurate accounts are seldom kept, and consequently it is most difficult to compile reliable data. The life is undoubtedly hard, especially in the rainy season and during the hot and more unhealthy months, which are April, May, and June. The men in these outside camps, living away from decent conditions and comforts, frequently suffer from malaria, camp-fever, or 'black-water,' and these severities are accentuated when the venture is a bad one and money is being lost. All sorts and conditions of people are found working these plants, and the individuality or character of the individual is quickly evident from the manners and system that surround his small undertaking. The catalogues furnished supply a fund of information, but their statements as to results should be accepted with a grain of salt. The cases described in this article are actually a collection of notes taken at different periods on the spot, and they represent as closely as possible the results obtained while they were written.

First case; one Tremain mill was operating, crushing 10.9 tons per day, being a duty of 5.45 tons per stamp. With this plant the consumption of oil was 20 gal., costing 3.9d. per ton of ore crushed. This, however, included oil used on a hauling engine and small steam-pump, as well as on the mill. The fuel was wood and cost 12s. per cord, and it took 85½ cords to crush 328 tons, or 3s. per ton. Shoes and dies came to £7 10s. 0d. per month, being four shoes and two dies, at 22s. 6d. and 30s., respectively. The ore was a fairly hard, oxidized quartz.

Second case; the mill was perched on the side of a steep hill, and the boiler, an ancient specimen, showed a pressure of 120 lb. steam, because, besides supplying the mill, it was working a pump at a level 100 ft. below the mill, and was throwing water from a stream to the mill. The fuel consumption was 2½ cords per day, costing 12s. 6d. per cord; the shoes lasted three weeks, and the dies four weeks, crushing hard quartz through a 20-mesh screen. In this instance the owners seemed uncertain what tonnage was being treated. In fact, they were very uncertain about the consumption of most of their stores.

Third case; the mill was in the Penhalonga valley, near Umtali township; fuel was very scarce, and cost £80 per month (at 25s. per cord). The owners considered that the mill dealt with 12 tons per day through 20-mesh, but they had never taken any careful measurements. The ore was oxidized quartz and schist.

Fourth case; fuller data were obtainable; the mine and mill were on sloping ground, close to each other, in thick 'bush-veldt,' 10 miles from the railway and 1200 yd. from a large river, which furnished the water. Two white men and about 70 natives were at

work; at the outset a mechanic was engaged to erect, start, and work the mill, but in about three weeks the owner learned to handle it himself.

The original outlay may be summarized as follows:

	£	s.	d.
Tremain mill	300	0	0
Mine-pumping and piping	57	0	0
Boiler, 6 hp., for river pump	50	0	0
1200 yd. pipe-line, at 11d. per foot	185	0	0
4 tanks for mill and boiler feed-water	40	0	0
1 donkey-pump	8	0	0
Old iron (corrugated) for housing	11	0	0
Pipes, fittings, tools, freights, forwarding	103	15	1
Total	754	15	1

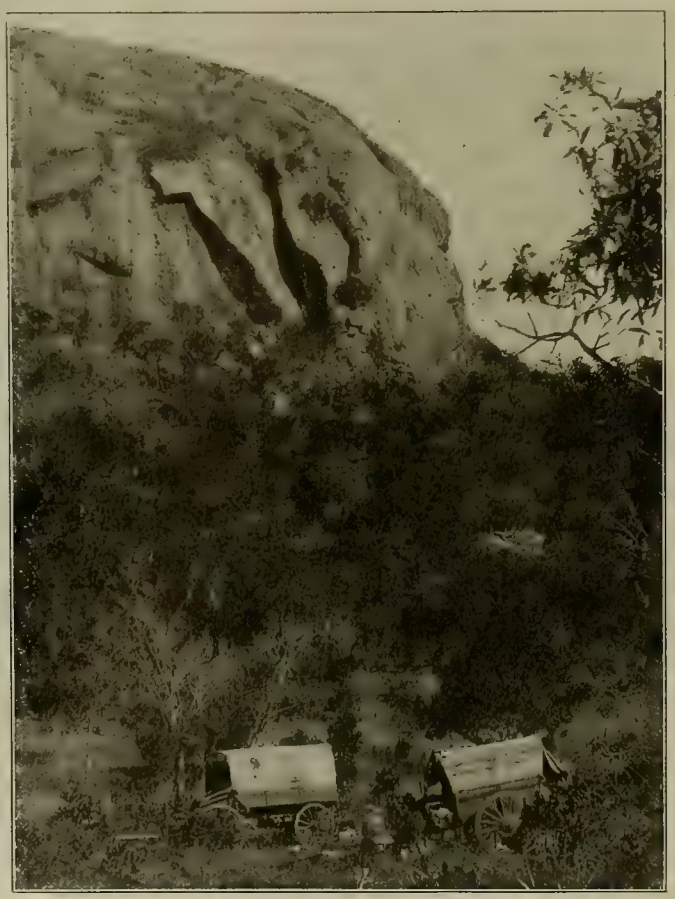
One boiler was on the property to start with, and, excepting the mill, the above was all second-hand material. Mining, milling, and general expenses for five months are given as follows:

	£	s.	d.
Mining and milling,			
White wages	210	6	8
Native wages	170	0	0
Stores	303	7	1
General,			
White wages	69	10	0
Native wages	103	4	0
Stocks and stores	166	12	11
Mess account per man	57	4	2
Traveling expenses	20	4	0
Miscellaneous	13	5	0
Prospecting	9	4	5
Bank charges	2	13	6
Total	1,125	11	9

The figures given make no allowance for owner's time, and a few other smaller charges appear to be omitted. It will be seen that 'stores' occupy a high percentage of the total costs. In Rhodesia fully 40% of the total expenditure goes to 'stores,' owing to the high freight and rates. The average cost for five months of native labor came to 26s. 3d. per head, while the food-consumption worked out at 2.7 lb. of meal per head per day. Each individual does not consume more than 2¼ lb. The mill was worked by one 10-hp. boiler at 100 lb. steam-pressure, making 170 blows per minute. The cutting price of wood fuel per cord for 4-ft. lengths is 4s 6d., and for 2½-ft. pieces it is 5s. The consumption amounted to three cords per day, but this includes wood burned at the pumping station previously mentioned.

The ore was schist and quartz mixed, and the mill crushed 10 tons per day through 26-mesh screens which were bursting daily at first, due to over-feeding, and from the same cause the guide-blocks wore badly and had to be raised. Under normal conditions 26-mesh screens lasted 2 days, and 24-mesh 3½ days. Soft ore seemed to make the dies cup.

The silvered copper plate provided with the mill measured 9½ by 4 ft. and was set with a drop of 1½ in. per foot. It was scraped daily and dressed every six hours. The oil consumed was 10 gal. per week, costing £8 8s. 0d. per month. The sight-feed lubricator attached to the steam-pipe is one of the most important factors with the mill. It must be carefully attended to, and adjusted, for in many cases it can be seen going wrong, owing to the vibration, and as soon as the steam-stamps are insufficiently lubricated they practically cease to work. At this mill from two to three drops per minute was the allowance. The amalgam yielded 37.3% bullion having a fineness of 800. With this mill, as well as others in the country, feeding mercury into the mortar-box is practised, but the advantages are not apparent. The loss or consumption of mercury from the crushing of 720 tons, yielding 305 oz. fine gold, was 4.8 dwt. per ton. The tailing assayed 4 pennyweight.



Prospecting in Rhodesia. Typical Granite Veldt.

Selecting one month when the output was worth £453 17s. 9d., we find the following payments had to be faced, and these may be regarded as a fair example.

	£	s.	d.
Royalty to claim owners	56	6	6
Government royalty (2½% of the gold)	11	0	10
Bank charges	7	12	6
Claim licenses	5	0	0
Total	79	19	10

The bank charges, analyzed further, are as follows:

	£	s.	d.
Melting the gold	3	7	0
Commission and transfer	0	19	9
Refining (at 4d. per oz.)	2	4	9
Assay fee	1	1	0
Total	7	12	6

From these figures it will be seen that the Government fee reached £16 0s. 10d., made up from claim licenses and royalty. The best run of mills was 24.3 days in a month of 31 days, but in this case loss of time was in a great measure attributable to having only two white men.

The joint between the mill-cylinder casting and the valve-chamber should always be well made. In the present case brown paper and thin canvas were both tried, but are stated to have been unsatisfactory. Eventually woven asbestos and graphite, also cardboard and boiled linseed oil, were used, and answered well, the former lasting one month. The foundation block was buried only 7½ ft. deep, and the automatic feeder was dismantled, since it did not suit the ore. Between the boiler and mill 26 ft. of uncovered steam-piping could be seen. The natives engaged were distributed as below:

	Natives.
Breaking and shifting rock	7
Removing tailing from pits	3
Stoking boiler	1
Carrying wood to boiler	1
Total	12

About 800 to 1000 gal. of water were being pumped from the river and used each hour.

Fifth case; 30 miles beyond the last mine was another Tremain mill at work, under different conditions. The mine workings are on the top of a rugged hill covered with vegetation, and around it deep valleys have been eroded. The mill was on the bank of a large river 450 ft. below, and water for milling was raised by a small feed-pump a distance of 120 ft., delivering water into a 400-gal. tank. A 10-hp. Colonial boiler was connected to the Tremain by 20 ft. of exposed piping; the same boiler, besides its own feed pump, served the pump, raising water from the river, but steam was condensing badly and the boiler foundations were disintegrating; the boiler looked as if it were going to tumble into the river. One drop of oil was being fed for every 40 blows the stamps made. The mills are invariably connected to the steam-pipe from the boiler by a loop of 1-in. piping; this is done to take up the vibration, contraction, and expansion. In spite of this loop, in every case described, this tended to loosen the joints and to throw the sight-feed lubricator out of adjustment, and, as stated before, when lubrication is deranged, the mill gives no satisfaction. Flexible steam hosing would be an advantage instead of the iron looped pipe described, but oil ruins it quickly. Probably a loop of 1-in. copper piping would answer better. The steam exhaust must be carried away from the mill, and escaping steam checked, since it is charged with oil and gets onto the plates, interfering with amalgamation. Attention must also be paid to packing the rod projecting through the steam-chest ends. This chest contains the slide-valves operated by the exhaust. The joint between the steam-chest and the cylinder on this mill was made with red-leaded canvas, and lasted three months; the makers recommend a paper gasket, but this did not answer on the mills referred to. Ore was conveyed from the mine to the mill in a two-wheeled cart, taking two tons per load. Six mules were kept, two working at once, each taking three loads. Altogether nine loads were delivered per day, and eight loads were sufficient to keep the mill going. It was 1200 yd. from the mine to the mill, and the ground dropped 350 ft. The mules were rationed with 6 lb. of 'mealies' (maize) per day, at 30s. per bag (203 lb.). The monthly cost was as follows: mules' feed, £8 10s. 0d.; native driver, £3; total, £11 10s. 0d. Cost of transportation would be made up as follows:

	£	s.	d.
Driver and food for 12 months	138	0	0
Mules and cart, 1 year's purchase	350	0	0
Repairs	40	0	0
Total	528	0	0

This comes to about 5s. per ton. One year's purchase sounds drastic, but these mules are usually old, and are often destroyed by lions. Stores were carted six miles from the railway, this costing £4 per month. Fuel worked out at £1 per cord, because it was being carried to the boiler by Kaffirs. This took 15 natives, and the total outlay in this direction was £30 per month (including food). The fuel-consumption was 1½ cords per day, or 3s. 8d. per ton. Steam-pressure at the boiler was about 100 lb., and the running time per day averaged only 15 hr., due to old and faulty boiler-fittings. The mill was crushing 8 tons per day, but with a higher pressure in the boiler and better running time there would probably have been no difficulty in getting through 12 tons. At 100-lb. steam-pressure the mill made 140 blows per minute, whereas 200 would have been a reasonable speed.

For 112 tons crushed, shoes and dies cost £6 7s. 6d., or 1s. 1d. per ton. Twice a month a clean-up took place. On this occasion it was usual to recover about 15 lb. of drill steel. The mine-smith was a native and probably burned his drills frequently. At one of the clean-ups the amalgam obtained from mortar-box was 22 oz., from the mercury trap 5, and from the plate 78 oz. From this amount 41 oz. of retorted gold was recovered, worth £4 per ounce. Inside plates were being used, and the mercury was fed into the mortar-box. The screens lasted 40 to 48 hr. by reversing. Tailing passed through a mercury trap and over a short-line of blanket-strakes. A panning of the tailing taken below the blankets showed considerable losses from floured mercury.

The Tremain mill, with its parts as originally supplied, were good material, but the complaint was that the spare parts supplied to replace the worn-out portions were inferior in quality. Generally these mills are useful in countries like Rhodesia, where transportation is a serious factor and the deposits are small, but there is no doubt that they render excellent service. As regards running-time, they would not come up to the standard of ordinary gravity-stamps. Inside amalgamation in the majority of cases would seem to be a mistake. The lip-plates supplied and

fixed to the mortar seem unnecessary. Complaints are sometimes heard as to the difficulty of keeping the shoes of an even length, but this can be overcome by ordinary care, and the fact that one man can keep one of these machines in perfect running order while at the same time attending to many other details, shows they can be handled easily. Among the points deserving close attention are, the projecting-rod from the steam-chest, which should always be carefully packed; the sight-feed lubricator, which should be rigidly fixed; the prevention of the escape of steam; and regulation of the feed to a size no larger than a walnut. Frequently small cyanide plants are

Tremain Stamp Mill in Prospect Work, Rhodesia.

attached, costing £300 to £400, made of corrugated iron.

The following are the expenses for one month, exclusive of the owner's time, the gold during that period being worth £303 4s. 9d., so a loss is shown in the month's work:

	£	s.	d.
Stores	99	8	5
Native wages	78	10	1
European wages	75	0	0
Transportation, 5615 lb.	4	10	0
Rails	0	15	2
Traveling expenses	4	12	6
Repairs to wheel	2	0	0
Postage, telegrams, etc.	0	19	0
Royalty to farm owners (20 cords at 3s.)	3	0	0
Claim licenses to Government	7	10	0
Depreciation of machinery and plant (£681 18s. 2d.) at 2½%	17	1	0
Bank charges	3	0	0
Royalty to lessors on value of gold won (17½% on £303 4s. 9d.)	53	1	3
Total	349	7	5

The output of 112 tons crushed cost £3 3s. 4d per ton.

A MODERN FUEL-OIL STORAGE SYSTEM.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. BEECHER.

At the 15,000-kw. steam-power central station recently installed at Redondo for the Pacific Light & Power Co., by the engineering firm of Charles C. Moore & Co., will be found a system of storage for fuel oil, which for reliability of service, as well as for safety, far surpasses anything to be found on the Pacific Coast. Not only is every contingency of operation provided against, but protection from fires and explosions is so well disposed of as to render impossible the repetition of the fire which occurred at this plant on January 27, 1908.

The general arrangement of the oil tanks is as follows: Oil is fed by gravity from the cars into a receiving tank, whence it is pumped into the main storage-tank, from which it is daily drawn into three auxiliary tanks. From these the oil is pumped through an oil-heater to the burners under the 18 Babcock & Wilcox water-tube boilers with which the plant is equipped.

As mentioned above, on January 27 a fire occurred in the auxiliary tank No. 1 which spread to the two remaining tanks, consuming about 2000 bbl. of oil. These auxiliary tanks are of reinforced concrete, and are roofed over with a reinforced concrete cover or ceiling at the level of the boiler-room floor, to conform to the underwriters' requirements. This roofing is placed on I-beam supports, and is provided with a man-hole. In accordance with Charles C. Moore & Co.'s design this man-hole was to have been protected with a fire-proof cover, secured in place by staples, and padlocked. The doors into the boiler-room were to have been fire-proof. At the time of the fire, however, there were no permanent covers on the man-holes, nor were the doorways into the boiler-room provided with doors. The tanks were provided with smothering-pipes in accordance with the underwriters' rules and specifications. These extend below the ceiling of the tanks, where they were left open-ended.

The use of a lantern in or around the oil tanks was contrary to orders, and smoking in the building was strictly forbidden by the Pacific Light & Power Co., which was particularly strict in this regard. In spite of all this, one of the men, on finding the fuses out on the lighting circuit attempted to measure the oil-level with a lighted lantern. An explosion ensued, igniting the oil in the tank. In an endeavor to smother the fire by turning on the steam from the smothering-pipes, the heated and burning gases were driven into the chamber above, causing a second explosion, demolishing the ceiling of the tank. The flames came through the doorways, ignited the other tanks, and did considerable damage in the boiler-room. While the fire was yet burning the Pacific Light & Power Co. placed the matter of re-design in the hands of the engineering department of Chas C. Moore & Co. Profiting by this experience, the fuel-oil tanks were re-built, and ample protective steps were taken in the reconstruction to ensure, first, a fire-proof system, and, second, an isolating arrangement,

whereby any fire would be confined to one tank. The chambers above the tanks, formed by the retaining walls, and running up a few feet above the grade-line, were open from one tank to another, before the fire. Brick partition-walls have now been put in, isolating these chambers one from another. These partitions are provided with fire-proof doors. A few feet above the grade-line there is a second or shelter-roofing. The brick partitions extend several feet above this roofing. The doorways into these chambers from the boiler-room have been bricked up so that no admittance can be gained except through fire-proof doors connected to the sump-hole. With this arrangement, should a fire occur, the damage would be confined entirely to one tank, and would in no way jeopardize the other tanks nor the operation of the plant. As a final precaution against a shut-down there is provided an independent connection of ample size for the operation of the plant at full capacity, whereby oil may be taken directly from the oil-storage tank. This oil line enters the building on the north side of the plant, and is entirely independent of the auxiliary tanks.

A few feet below the shelter-roof is suspended a ring of extra heavy 4-in. pipe, provided with numerous jets formed of ¾-in. pipe, capped, and with a horizontal cut or slit across the cap. This ring is used in lieu of the usual smothering-pipes and serves as such. It is provided with the proper connections for bleeding in order to prevent water-hammer. When steam is turned into the 4-in. pipe, a sheet of steam is formed by reason of the fan-shaped jets, absolutely shutting off the air-supply and thus effectually smothering the fire. The cloud of steam, as well as serving as a blanket, by its rising action draws any stray air currents with it away from the fire, and drives them upward. This system of smothering is most modern, and supercedes the old arrangement of smothering-pipes, where there was a possibility of an explosion, and of the combustion of surrounding properties due to gases driven out of the tank by the steam, as on January 27, 1908. The control-valves of these smothering pipes is placed at a point easy of access from either the engine-room or the boiler-room, and is padlocked to prevent misuse.

For the purpose of measurement of oil burned, each tank is provided with a balanced float-measuring device, which shows the height of the oil in the tanks. This height is shown on two scales, one in the boiler-room, and one over the top of the tanks. With this system, accurate account is taken, and records kept, of the amount of oil burned during each six-hour period. Each tank is properly vented and provided with a supply-pipe, oil-pump suction with foot-valve and strainer, oil-return line, oil-circulating pump-suction, oil-circulating pump return-line, steam to warming coils, and return from warming coils. The valves on these pipes are all placed on the boiler-room side of a concrete wall 3 ft. thick, between the boiler-room and the auxiliary tanks, this scheme making it unnecessary for any of the operatives to enter the chamber above the tanks for any purpose, and consequently doing away with the possibility of breaking the rules regarding lanterns, thereby lessening the fire-risk. This arrangement also insures the boiler-room operatives from danger, and permits the operation of all valves from the boiler-room during a fire.

When warming up an oil tank preparatory to the 'cutting-over' of the plant onto it, the oil-circulating pump is started. The oil-discharge line from this pump contains a thermometer-well together with a scale-case thermometer. In this way the boiler men can watch the oil-temperatures in their tanks without leaving the boiler-room. The suction line of oil-circulating pump is arranged with a swivel joint so that it can be raised or lowered. By pumping from the bottom of the tank, this pump can be and is used to discharge to the sump the entrained water which settles from the oil.

The complete control of the amount of oil, of the amount of steam for atomizing the oil, and of the air-supply, is automatically accomplished by means of a new system of regulation invented by J. R. Atchison and C. R. Weymouth. By use of this system the steam-pressure is kept uniform. At the same time the most perfect conditions for combustion are maintained, irrespective of the load, namely, a constant automatic adjustment of steam to the burners and the air-supply, with the variation of oil-pressure. In this way the oil is properly atomized, and the right amount of air for combustion is furnished. This automatic system of regulation proved to be an important factor in the maintenance of the wonderful record made by this plant during the recent test. The testing committee's report states that the unparalleled average economy of 252.842 kw. hr. per barrel of oil burned was obtained during the 15 days' test. This economy was based on 18,500 B. T. U. per pound of oil, and 334 pounds of oil per barrel.

Detection of moisture, according to Biltz, may be made by taking advantage of the fact that $2KI.PbI_2$ is colorless, but is partly dissociated by moisture, giving the yellow tinge of PbI_2. The re-agent may be prepared thus: A filtered warm solution of 4 gm. $Pb(NO_3)_2$ in 15 c.c. of water, is mixed with a warm solution of 15 gm. KI in 15 c.c. of water. PbI_2 first precipitates; on cooling the yellow color diminishes, until the mass becomes a network of interlocking white crystals of the double salt. After sucking as dry as possible on a filter, this is dissolved in 15 to 20 c.c. of acetone, which is filtered. The re-agent can be used in this state, or the salt may be precipitated out by adding double the volume of ether. The acetone solution may be used to impregnate filter paper, which slowly turns yellow from the moisture in the atmosphere (immediately if breathed upon). Such a paper may be used in many ways for the detection of minute amounts of moisture. Moistening with acetone restores the colorless condition.

Japan imported $13,754,000 worth of machinery during 1907, which is 49% more than in 1906, and 112% in excess of the average for the preceding five years.

CRUCIFORM STEEL FOR MACHINE-DRILLS.

Written for the MINING AND SCIENTIFIC PRESS
By E. P. KENNEDY.

Drills for machines are commonly made by welding a piece of cruciform steel, approximately 14 in. long, to a bar of octagonal steel. The chuck-bushing of the machine-drill is ordinarily made either to receive round steel, in which case the octagonal steel has to be rounded for a length equal to the depth of the chuck-bushing, or the chuck-bushing is made to receive octagonal steel, and if one size of octagonal steel is used for all lengths of drills no blacksmith work has to be done on the shank-end of the bit. If two sizes of octagonal steel are used, the bushing can be made to receive the larger size, and the smaller size may be upset to fit the bushing; or, as is sometimes done, a short piece of the larger octagonal steel is welded to the end of the smaller octagonal steel.

There are some mines that use cruciform steel for the entire drill, and round down the shank-end to fit the chuck-bushing. This makes a weak steel, subject to breakage. The use of all cruciform steel, and chuck-bushings made to receive cruciform steel is, in so far as the writer knows, used in no other place for piston-drills than at the Treadwell mine, Alaska. There are many advantages in the use of all cruciform steel, some of which are: In drilling back-holes, which are slightly damp, with steel made by welding cruciform to octagonal steel, it is a common occurrence to lose a six or seven-foot hole by reason of the men not being able to get the steel out of the hole, and hours of time are often wasted in the attempt, whether successful or not. With the use of all cruciform steel, the ribs and grooves act much as a spiral conveyor to remove the dirt from the cutting-face, and there is no difficulty in removing the drill.

Each piece of welded steel costs about 50c. to make, which item is saved by the use of all cruciform steel. The use of a cruciform chuck-bushing obviates work on the shank-end of the steel, or almost does so. The practice at Treadwell is to use 1½-in. cruciform steel for the first two drills, and 1¼-in. cruciform steel for the last two, four pieces of steel ordinarily making a set for the average depth of hole bored, which is 7 ft. The 1¼-in. cruciform steel is upset slightly to fit the bushing, which is made to receive 1½-in. cruciform steel.

The change from welded steel to cruciform steel reduced the weight of steel in use in the Treadwell mine 16%, the cruciform shape making a more rigid and stronger bar than the octagonal or round steel. In the rough usage which steel gets in being thrown around, there is considerable breakage of the welded steel. The breakage occurs in the weak part of the steel, namely, near the weld. This is assuming that the welding is well done, which is not always the case. The use of the cruciform bushing reduces greatly the breakage of the chuck-bolts, and the general wear and tear on the machine, and it lasts three times as long here as the octagonal bushing.

The common practice among machine men of running with a loose chuck-bolt to ream out a hole in order to allow another drill to follow is very expensive practice for the company supplying the machine extras. This 'running with a loose chuck,' as it is called, can be done with a round bushing, and also with an octagonal bushing, for the octagonal bushing is not in use long before it is reamed out practically round. With the cruciform bushing the piston cannot turn unless the drill does, and it is impossible to try to run with a loose chuck. When properly equipped there is little difference in the cost of making octagonal or cruciform bushings. At mines where machine drill-sharpeners are used for putting a cross-bit on an octagonal bar, no saving would be made in the blacksmith work by changing to cruciform steel, but they would gain by obtaining a stiffer stronger steel for the same weight by using cruciform steel, and thus would save in machine extras by using cruciform chuck-bushings. Where the ground is soft, and the wear and tear on the machines and steel is slight, there may be no appreciable advantage gained, but where the ground is stiff, and the consequent wear and tear on the machines and steel is heavy, the advantage in the use of all cruciform steel and cruciform chuck-bushings is apparent.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

B. P. C., Goldfield, Nev.: Garnet.

G. E. W., Los Angeles, Cal.: pectolite.

L. C. M., Mexico: rhyolite breccia with some sulphides.

H. H. B., Eureka, Cal.: chlorite schist coated with limonite.

M. L. C., Lake City, Colo.: halloysite; hydrated aluminum silicate.

T. McC., Pioche, Nev.: sandstone, slightly metamorphosed, and schistose.

D. H. P., Hamilton, Nev.: No. 1, travertine; No. 2, powder composed of calcium carbonate.

E. C. D. M., Pioche, Nev.: red clay, colored by iron, looking much like 'gouge' material from vein walls.

J. P., Eureka, Nev.: quartz coated with a mixture of basic salts of iron, the phosphate, sulphate, and silicate.

W. H. P., Goldfield, Nev.: No. 1, asbestiform amphibole; a poor grade of asbestos; No. 2, diatomaceous earth; No. 3, asphaltum; gilsonite.

W. H. B., Shasta county, Cal.: No. 1, metamorphic andesite with bornite and traces of chrysocolla; No. 2, metamorphic rock too altered for identification, with chalcocite, cuprite, traces of copper carbonates, and limonite; No. 3, bornite, pyrite, malachite, and cuprite in a silicified and decomposed rock.

SILVER.

By Theo. F. Van Wagenen.

*Previous to 1870 silver was reckoned as one of the precious metals, and possessed, by virtue of an unwritten agreement between the principal nations of the world, a definite value in terms of gold, namely, $1.29 per fine ounce. The metal was never purchasable at less than this figure, and usually commanded a premium, which, during the last century, ranged from nothing up to as high as 10%. It is now purely a commodity, like all the other metals except gold, and while the demand has greatly increased since the date mentioned, the production has nearly quadrupled, and the price has fallen steadily until during last year it averaged 65c. Singularly enough, since this great change silver has become one of the three metals (nickel and copper being the other two) that circulate as coins at a valuation far above their commodity-price. This, of course, is due to the fact that they are by law legal tenders up to certain amounts, but the circumstance illustrates the vagaries of human laws when they come into conflict with those of nature. The American quarter, the English shilling, the Latin Union franc, the German mark, the Austrian kroner, the Russian rouble, all being coins that circulate freely at valuations ranging from 20 to 25c. of our money, would bring, if melted and sold as bullion, little more than half those figures. On the other hand, the Indian rupee, of approximately the same weight and fineness, not being backed by any such law, circulates at its commodity value only, and its purchasing power in the markets of the world fluctuates with the price of the metal.

Silver sometimes occurs in nature in the metallic condition, and it is due to this fact that it has been known from very ancient times. But it is not found, like gold, in grains or nuggets in the gravel of stream beds. Its principal habitat is the vein in rock, and hence it may be inferred that in antiquity the quantity possessed by man was much less than that of gold. To primitive man the latter metal was regarded, in a way, as a fragment, or at least as a representative, of the sun, while silver bore the same relation to the moon in his mind. When the interior of China becomes well known, it is likely that the remains of ancient silver mines will be found here, for the metal has been produced in that nation, in small quantity, from remote antiquity. There is no evidence that India ever possessed silver mines of note, but in Burmah have been found extensive slag dumps rich in lead and zinc, and carrying a notable percentage of the white metal. In the little known and rugged region between Hindustan, the Persian Gulf, and the Caspian Sea, embracing the crude nationalities known as Persia, Armenia, Afghanistan, and Beluchistan, there has been a small production of silver since early historic times, and the same may be said of Asia Minor. The Grecian peninsula, however, possessed a silver-producing region of great importance and high antiquity, from which, as early as 1000 B. C., the metal came in notable quantity. There are no known ancient silver-producing districts of note in Africa, but the Italian peninsula and Spain yielded the metal in early historic times, the former moderately and the latter very abundantly. In fact, Spain was really the first great silver-mining country of the world.

More than any other metal, silver has been intimately associated with the advance of civilization, or rather, of that very important department of human activity that is called commerce, meaning thereby international trade. Authentic history seems to begin with the fact of two comparatively peaceful, industrious, and frugal races, occupying the rich valleys of the regions now called India and China; and a lot of turbulent, migratory people in western Asia, eastern Europe, and northern Africa, who devoted much of their time and energy to fighting and destroying each others' homes. Between the two was the highest and most difficultly passable mountain chain in the world, known now as the Hindoo Koosh and Himalaya range, which for centuries, and perhaps milleniums, kept them apart effectively enough to allow each to develop its own peculiarities. The first, whom we distinguish as Orientals, appear to have settled down at an early period to agricultural pursuits, and to such peaceful arts and occupations as were naturally the outgrowth of ruralism. Population grew, a crude and quiet, yet strong trading capacity developed, religious advance was marked. It was not of the proselyting kind, but was rather contemplative and introspective. The arts progressed only to a certain point, and then became stationary. Wealth was attained by industry and accumulation mainly, and did not often arise from exploration or conquest. Such luxury and ease as resulted never passed far beyond the barbaric stage. The sciences did not become exact or even organized, and they have retained, even to the present day, an air of mysticism.

The second, whom we may call the Occidentals, advanced along wholly different lines. Every department of life was more strenuous. The increase of population was perhaps as great, but the destruction of life by wars and through slavery was enormous. The arts flourished, but their product was continually being looted by conquerors. This ruthless destruction, however, seems to have incited rather than discouraged improvement.

Between these diverse and different kinds of humanity a trade slowly sprang into existence. It was first, doubtless, by way of the Arabian Sea, which at some time in the distant past was a *mare clausum*, a Mediterranean. The Western nations sought the luxurious and decorative products of the Eastern, their fabrics of silk and wool, their manufactures of bronze, their gems and jewelry of ivory and jade. What could be given in exchange? The money of the East was silver, it was scarce there, and its purchasing power was great. Consequently when the strenuous West began to produce the metal in quantity, first from the mountains of Persia and Asia Minor, and later in Greece, Italy, and Spain, it became possessed of an article with which the products

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of the East could be obtained. But the West loved war above other things, and had the warrior's immemorial contempt for trade. So when there grew up at the extreme eastern end of the Mediterranean, a nation of traders, the Phoenicians, they promptly took charge of the commerce between the Occident and the Orient. For centuries the Phoenicians were actually protected in turn by all the great powers of antiquity because of their trading ability, and their knowledge of where and how to get the products of Asia that Europe wanted. We know that the ships of Tyre and Sidon ransacked the shores of the Mediterranean for silver, and were the owners and operators of mines of that metal in Greece, in Italy, and in Spain. Their product was sent overland by caravan or oversea by ships sailing from ports on the Persian Gulf, and later from ports on the Red Sea, to India, to be exchanged for the goods of the East. One of the most valued of these was tin. Malaysia has been from the most remote antiquity, and is today, a prolific producer of this metal, and early in the history of the human race the extremely desirable qualities of the alloy (bronze) which it made with copper became known. For many centuries primitive Europe poured its silver into Asia and sold it for tin. In due time the demand became greater than the supply. At the same time the product of the European silver mines began to fall off. The price of tin in terms of silver increased greatly. So also did the value of silver. In this crisis, which threatened the very existence of trade between the East and the West, two remedies were tried. The Greeks, the dominant nation of the time, under Alexander the Great, started out to conquer India, and to find and capture the Asian tin mines, but, as we know, he got no farther than the Indus. Simultaneously the Phoenicians, in their search of the western world, found tin in Britain. When Cornish tin began to come into the market, the 'corner' that Asia had for so many centuries maintained on tin was broken, the Malaysian mines fell rapidly into decadence, and the ancient value of silver in the East was resumed. Europe then had the advantage, but as its silver product was declining, its trade with India fell away, and the two far-separated dominant peoples of the world almost forgot each other. Europe, now well supplied with tin and copper, devoted itself to strenuous war and destruction. A thousand years or more later, when the Roman Empire had passed its prime, new silver mines were found in central Europe, and again trade with the East began to revive. Venice was then the commercial centre of the world, and it flourished as long as the Austrian and German silver mines were in bonanza. When the cream of these was skimmed it began to decline. From that day until the Spanish galleons began to bring silver from the New World, times were hard in Europe, civilization languished, and humanity suffered. Historians call the period the 'Dark Ages.' History also records the wonderful change that took place when the Mexican and Peruvian silver mines began to pour their flood of treasure into Europe. There was a marvelous revival of industry, and of the arts and sciences, and the greater part of it was directly due to the enormous coinage of Mexican silver dollars, and their wide distribution in trade. This coin for three centuries has had a larger circulation, and has become more extensively known, than any other tangible product of the hand of man.

From the discovery of America to about the beginning of last century, the source of the world's supply of silver was almost entirely the mines of Mexico and of the west coast of South America. The production in this period is estimated by statisticians at nearly 200,000 tons, and its value (then about $30,000 per ton), at $6,000,000,000. The bulk of this vast total went first to Europe, more than half of it in the shape of coins of American mintage. The remainder went into European coinage and plate. This great store of what was, in those days, a money-metal of unlimited legal-tender value, enabled the New World to buy what it needed of Europe, and permitted the latter to resume its trade with the Far East. Spain, practically the parent and owner of those regions whence the metal came, prospered prodigiously, and became the wealthiest of the nations. But in 1810 its colonies began their struggle for independence. Spain resisted, and beggared herself in the effort to retain them. The contest lasted more than a decade, and during it the silver-mining industry suffered greatly. In South America it was almost suspended. The supply of the metal in Europe for coinage became scant, the trade with the Orient again declined. In the middle of this period, when the destructive career of Napoleon was coming to an end, when all Europe was in financial distress, and vast amounts of plate had gone to the melting pot to be transformed into coin, with silver advancing in value (in terms of gold) until it commanded the equivalent of $1.40 to $1.45 per fine ounce, with the coinage of some of the nations in process of debasement by the addition to the alloy of lead and tin, England, in 1816, established the mono-metallic gold basis, and started the train of conditions that later (in 1873) resulted in the complete demonitization of the white metal. And in this connection it is a curious fact of history that while England in 1816 abandoned silver as a money-metal because of its scarcity and high relative value in terms of gold, the rest of the great commercial nations followed her footsteps nearly fifty years later because of its abundance and falling value.

When Mexico became independent, in 1821, it passed into a condition of anarchy that lasted almost a half-century. In this period its mines were operated under the greatest disadvantages, and the amount of silver exported was comparatively small. But as soon as political affairs became settled, under President Diaz, the mining industry began to revive, and today the Mexican output of the white metal exceeds that of any other nation. Previous to 1859, when silver was first discovered in the United States (in Nevada), silver mining was not an organized industry, but an occupation dependent largely for success upon the accidental discovery of bonanzas of rich ore, coupled with the ability to secure labor upon a basis of practical slavery. Only one step on the road of progress had been taken in the metal-

lurgy of the metal, namely, the invention of what is known as the 'patio process.' But when it became evident that the Comstock Lode, in Nevada, contained vast quantities of silver, the natural ingenuity and aptitude of the American transformed mining into a commercial industry, and the metal began to pour in such torrents into the money centres of the world that financiers became alarmed, and between 1870 and 1873 full coinage-rights were denied by the principal nations. Meantime, a remarkable industry had come into existence in the mountain regions of the West. Thousands of silver mines had been discovered, scores of processes put into practice for the treatment of their ores, and a vast number of metalliferous deposits developed that have since been yielding copper, lead, zinc, iron, and manganese, in addition to the white metal.

Silver occurs in veins or deposits in the rocky crust of the earth, and is never found in the gravel of stream-beds, as is gold. In a small number of cases the gangue, or material with which the metal is associated, is quartz alone, but generally one or more of the base metals is present, predominating vastly in quantity, and often in value. This is especially true after a little depth is gained on the veins, so that in due time mines that were opened as straight silver-deposits become deposits of the other metals, the silver being practically a by-product. A good example of this change is to be found in the lodes at Butte, Montana. The veins at Parral, Pachuca, and Guanajuato, in Mexico, are examples of straight silver mines, yet all of them are showing more or less associated iron or copper as depth is gained. On the other hand, wherever lead is found, silver is always present in some quantity, and at the Comstock, as well as at the Mexican districts mentioned, there is invariably a proportion of gold. In the Comstock bullion it amounted to 40% of the total value. Thus the metallurgy of silver is not a simple matter, and between 1860 and 1873, when the metal had a value of about $1.30 per ounce, a vast amount of study and experiment was devoted to the question of recovering it from its ores by milling processes, or methods not involving the fusion of the minerals. But as the West became opened by railroads, so that ores could be cheaply transported to natural centres, where coal or water-power existed, and where labor was abundant and inexpensive, most of these processes were abandoned in favor of smelting. In consequence, the production of silver may now be considered as a settled industry, the metal being produced largely as a by-product.

Since its discovery in the United States the world's output has amounted to nearly 170,000 tons. There has been nothing comparable to this enormous yield in any previous era of history, and its fall in value may be considered as warranted, and perhaps permanent. The annual output of the world at the present time averages about 6000 tons, and is not at all likely to seriously decline. The American and Mexican mines show no signs of exhaustion. On the contrary, new mines are continually being discovered. Asia and Europe are not likely to become large producers of the metal. The settled parts of the Old World have been fairly well explored, and in the unsettled parts like Siberia, Turkey, and Africa, the mining laws are so burdensome that the prospector and individual miner will have nothing to do with those regions. We may, however, confidently look to South America for many new and great silver mines, when the political situation becomes as stable as it is in Mexico, for Spanish mining law has always recognized the necessity of the prospector at the base of the industry. The extent to which the American crop of silver is a by-product is shown by the following table, worked out by myself, for the year 1899, when the product of the mines of the United States amounted to about 2100 tons:

	Tons.	%
Production in connection with lead ores	750.75	35.75
Produced in connection with copper ores	514.50	24.50
Produced in connection with gold	504.00	24.00
Produced in connection with iron and manganese	173.25	8.25
Produced from straight silver ores	157.50	7.50

In Mexico, on account of the activity at Parral, Pachuca, and Guanajuato, the proportion of silver coming from silver ores is larger, and perhaps the same is true for South America. But in Europe, Asia, and Africa practically the entire product of silver comes from the lead and copper mines, so that for the entire world the proportions quoted in the above table would be about correct. The demand for the metal is growing, and may be expected to increase markedly in the near future. The largest consumers now, as in the past, are the three great backward races of the Far East, the Hindus, the Malays, and the Chinese. It takes from 2500 to 3000 tons every year at present to maintain trade with them, and but one, the people of Hindustan and Farther India, may be said to have more than wakened from their sleep of centuries. These number about three hundred millions of frugal, industrious, acquisitive people. When the four hundred million of Chinamen are thoroughly aroused, and the one hundred million of mixed races that include the Filipinos and the inhabitants of the East Indian islands, there will come at least as large a call for the metal as that which now exists. For silver is the only money that the Orient recognizes, or will use. The capacity of that part of the world for absorbing it has always been the wonder of economists, to whom Asia is known as 'the sink of silver.' Statistics show that an average of not less than 600 tons of the metal has been sent to the East by Europe annually during the last 300 years. Practically none of it has ever come back. Among the thousand million Asiatics it has disappeared, being absorbed in hoards of coin, or bars, or used as ornaments, or circulated as money. This curious process is in progress today with nearly fivefold the vigor of the past. Practically 70% of all the silver produced in Europe and America since the dawn of history is now in the possession of the Chinese, Japanese, Malays, and Hindus. Yet we regard them as a poverty-stricken people, which in fact they are, for with all this immense hoard of what was once the paramount money-metal of the world, famine or pestilence is abroad nearly every year in one or more parts of the Orient. This vast metallic accumulation

will not save them when crops fail and starvation is at hand, for the West, having demonetized silver, will not accept it in exchange for food except on the basis of a pure commodity.

From 400 to 500 tons of the metal is at present being consumed by the world in manufactures and the arts. Such parts as are used in photography and by the chemist may be regarded as lost, which amount to as much as 50 tons per year. The balance becomes tableware, jewelry, and ornaments. About 5000 tons goes into coinage, 50% of which is minted in Asia, approximately 25% in Europe, 15% in Mexico and South America, and the rest in the United States. All this, except the coinage of India, Mexico, and Japan, is bought by the various governments at the commodity-value of the metal, and after taking the stamp of the mint it goes to the public on the basis of the old ratio of 16 to 1, compared with gold. The difference is absorbed as profit, under the name of seigniorage. This profit to the treasuries of the civilized nations now amounts to something over $10,000,000 per annum, and is somewhat of the nature of a fraud on the people, though with the existing conventions in the matter of money and coinage, it is not easy to say how the fraud is to be avoided.

Considered wholly by itself, and from the standpoint of its purely physical properties, silver is yet a precious metal. Its pure white color and soft lustre can not be approached in aluminum, tin, nickel, or any other metal, and though it tarnishes quickly, and has not the resistant qualities of gold to the action of acids and of sulphur, yet no metal we at present know can take its place for small coinage, or for ordinary tableware and decorative purposes. Aside from these uses, it is the best conductor of electricity of all known substances, and there may be a special future for it in the wonderful development of that new servant of man. Perhaps as the science of wireless telegraphy and telephony advances, silver may come to be employed in the reproduction of sound waves when great distances must be bridged, or extreme delicacy of enunciation is desired. Yet copper approaches it so slosely in electric sensitiveness, and is so much more abundant and cheaper that we may not look forward to talking in future over silver wires.

The world's crop of silver during 1907 amounted to about 6400 tons, and came from the following parts of the globe in about the quantities given:

	Tons.
Mexico	2,300
United States	1,900
South America	420
Canada	400
Central America	35
Europe	760
Australasia	440
Japan	120
China and Malaysia	15
Africa	10
Total	6,400

From these figures it appears that nearly 80% of the annual product is coming from the western hemisphere, and if we add to this the output of Australasia, the proportion coming from what may be regarded as the newer parts of the world, rises to 85%. Finally, by including the European product, it appears that Asia, where the metal is most in demand, and where it still retains its old debt-paying quality, produces less than 3% of the world's crop. Hence there is still a large field for silver in the Orient, and its exploitation and development is undoubtedly the next great task of the Caucasian. In this view the silver miner may take some comfort.

NEW THEORY OF RAND ORE DEPOSITION.

The excellent assay-values disclosed by the developments in the Main Reef West, and the encouraging results obtained in the Vogel Deep, both of which mines are situated to the south of that exceedingly poor strip of outcrop which stretches from Langlaagte to the Durban Roodepoort, have suggested a new theory for the distribution of gold in the Witwatersrand banket. It is well known that the rich zone in which the outcrop and first row of deep-level mines of the central section are situated, does not, so far as revealed by present developments, extend into the deep-deeps of that vicinity. Having regard for the demonstrated fact that the Witwatersrand as a whole shows a remarkable uniformity of mineralization, and that comparatively rich patches are not confined to any one section, but are dotted over the whole length of the field, it would not be unreasonable to expect that the assay-values on the dip of an exceedingly poor outcrop would show a considerable improvement; indeed, the balance of probability actually points to that being the case. The theory in question, however, goes even further than that. It is to the effect that the rich central outcrop belt, instead of ending at Langlaagte, as commonly supposed, continues westward, and takes an inclined course on the dip, instead of clinging to the outcrop. This view is, of course, by no means in conflict with the known laws of ore deposition. The theory is, we believe, only put forward tentatively, until such time as the necessary data, in the shape of the assay plans of the developed mines in that portion of the Reef, have been examined. Many instances may be recalled where the outcrop is vastly better than the adjoining deep-levels. The stopes of the Jumpers mine, for instance, never fell below 10 dwt., while those of the Jumpers Deep never reached that figure. It is true that the two are separated for a great deal of this length by a longitudinal dike, but the balance of opinion today is that the dikes have no influence on the gold content. It is a matter, however, that cannot be said to be settled. Another explanation to account for the difference in outcrop and dip that has long been in favor is that the gold runs in northeast and southwest shoots. As we pointed out in a recent article, the gold in the Main Reef of the Jumpers mine undoubtedly occurred in shoots, and these shoots trended more or less in that direction. Another factor that introduces complications in endeavoring to arrive at a solution of this and allied problems, is the undoubted secondary enrichment that has taken place in the outcrop mines.—*South African Mining Journal.*

THE GRANADENA MINES.

Written for the MINING AND SCIENTIFIC PRESS
By S. F. SHAW.

The mines of the Granadeña Mining Co. are situated in the Hidalgo mining district, about three miles northeast of Santa Barbara, Chihuahua, Mexico. The ores are a complex mixture of galena, sphalerite, chalcopyrite, and pyrite, carrying varying quantities of gold and silver. In the early days of mining in the district considerable quantities of high-grade ore, consisting of 30 to 60% lead in the form of lead sulphide, carbonate, and sulphate, and various oxidized lead compounds high in silver, and in some cases in gold, were taken from workings at or near the surface. In the very early days extraordinarily high-grade gold ore was taken from the famous San Francisco del Oro mine, from the Tecolote mine, and from others near by.

These high-grade surface deposits have been largely worked out, and the greater part of the mining is confined to extracting the ore from the larger lower-grade orebodies. The principal veins being worked by the Granadeña Co. are the Granadeña, Merced, Gracia, Guadalupe, and San Luis. Many other veins traverse the property, some of which have been opened up to a small extent, while others have not yet so much as had a pick driven into them. The country rock is a close-textured shaly limestone with the veins traversing it in all directions. The geology has not yet been worked out, and it is not known which veins, if any, were the earliest. The dip of the veins, however, is fairly uniform, being usually about 70 degrees.

The greater amount of work has been done on the Granadeña vein, which is worked from two shafts, one inclined and one vertical. The inclined shaft is on a slope of 70°, and lies in the vein to a depth of 150 ft., where it runs into the country rock, owing to the vein dipping slightly more than 70° at this point. The total depth of this shaft is 370 ft. Five levels have been turned off, all of which are in the orebody that has been up to the present time developed. A total of about 4200 ft. of work has been done on this vein.

Until a year ago the ore was mined by both overhand and underhand stoping, and was very expensive. Underhand work was then stopped, and the levels so arranged that all the stoping would be done by overhand work. Stulls were set across the levels about 6½ ft. above the rail, and a lagging of slabs from 2 to 4 in. thick was laid across these stulls. The ore was then allowed to drop on this floor, and only enough drawn off through the chutes to allow room for the miners to work on the top of the broken ore. Hand-drilling was replaced by small air-hammer drills. These changes made a notable saving in the cost of mining. The ore is hoisted in buckets of about ½ ton capacity by a small friction hoist.

Air for the Granadeña and Merced mines is supplied by a 14 by 12-in. two-stage Norwalk compressor and an 11 by 17 by 16 by 10 by 12-in. cross-compound two-stage Laidlaw-Dunn-Gordon compressor. A No. 9B Cameron sinking-pump throws the water from the sump at the bottom of the shaft to the fourth level, from which it is raised to the surface by a 7 by 4 by 10-in. Smith-Vaile duplex pump. A 7 by 4 by 10-in. Smith-Vaile duplex pump then throws the water through a 3-in. pipe-line to the mill reservoir. The vertical shaft is 310 ft. deep, and when continued in depth will penetrate the vein at an estimated distance of 1000 ft. It is now connected with the fourth level. The ore is hoisted through this shaft by an 8½ by 10-in. double-drum geared Ottumwa hoisting-engine. From both inclined and vertical shafts the ore goes to sorting-bins, where the waste and a certain amount of shipping-ore are sorted out, the remainder going by surface-tram to the mill, a distance of about 1700 ft. A battery of four boilers, aggregating 280 hp., supplies the hoisting-engines and compressors with steam. The ore is largely oxidized to a depth of about 75 ft. At about 50 ft. there is a zone of gold-enrichment, from which point a considerable quantity of screened ore has been shipped, averaging about 1 oz. gold, 12 oz. silver, and 10% lead. Below this point occurs a zone of mixed oxidized and sulphide ore averaging 0.6 oz. gold, 9.5 oz. silver, and 10.5% lead. After the oxidized zone is completely passed, the ore averages 0.2 oz. gold, 7 oz. silver, and 10% lead.

The Merced vein is opened by an adit driven along the vein a distance of 1400 ft. The inclination is 70° from the horizontal, and the strike has a general northwest-southeast trend. The average width is 6 ft. The greatest depth reached by this adit is 160 ft., but as the vein at the breast turns somewhat more into the mountain, the continuation will give greater depth than this. Two shafts connect with the surface, and three winzes are below the adit to a depth of 1000 ft. or more each. To a depth of 100 ft. below the adit the ore is either entirely oxidized or is oxidized, with stringers of galena varying from a fraction of an inch to a foot in width running through it. Specimens can be picked out at nearly any point showing the stage of transition passing from galena through anglesite to cerussite. No. 3 winze, at a distance of 1000 ft. from the portal of the adit, is being made the main working-shaft for extracting the ore below the adit-level. It is 16 ft. wide and equipped with a 6½ by 8-in. single-drum Ottumwa hoist and a 50-gal. Cameron differential pump. This winze passes through a body of ore which careful sampling has shown to average 0.4 oz. gold, 18.5 oz. silver, and 34% lead. No. 2 winze is 140 ft. deep and is equipped with a 5 by 6-in. winze-hoist. Shipping ore is now being extracted from these two winzes. At a depth of 120 ft. below the adit the present water-level is found, and this is apparently the point at which the permanent sulphide-zone is reached.

The ore in the Merced mine is broken down entirely by overhand stoping, and is trammed to a 350-ton sorting-bin, from which point a single-bucket aerial tramway, with a span of 750 ft., conveys the milling ore to the mill-bin. A rich lead shipping product is sorted out, and from time to time a few tons of copper ore is also shipped. This is the only vein on the

property being worked at present. Development is being continued, and a few cars of very good shipping ore are being produced every week.

All development is done by Mexicans on a contract basis, varying from ₱20 per metre in the soft vein rock to ₱40 per metre in the hardest rock. The average price is about ₱25. The price paid for sinking is about ₱5 more than for driving. Powder, fuse, and caps are furnished to the contractors by the Company at cost price.

The mill was closed down on February 1, due to the drop in price of lead and silver, and has not yet resumed operation. It has a capacity of 225 tons per 24 hr. The ore delivered to the mill is treated as follows:

(1) Mill-bin, 200 tons capacity, to (2).

(2) Inclined grizzly, slope 45°, fines to (4), oversize to (3).

(3) 10 by 16-in. Blake crusher, through 1½-in. ring, to (4).

Granadena Mine and Mill, Santa Barbara, Chihuahua, Mexico.

(4) Storage-bin, 800 tons capacity, by plunger-feeder to (5).

(5) 16 by 36-in. C. I. W. rolls set ½ in. apart, to (6).

(6) Elevator to (7).

(7) Hexagonal trommel with ½-in. round-punched openings, undersize to (9), oversize to (8).

(8) 14 by 27-in. Davis rolls set ¼ in. apart, to (6).

(9) C. I. W. impact screen, 10-mm. openings, oversize to (15), undersize to (10).

(10) C. I. W. impact screen, 5-mm. openings, oversize to (6), undersize to (11).

(11) C. I. W. impact screen, 2-mm. openings, oversize to (17), undersize to (12).

(12) C. I. W. impact screen, 1-mm. openings, oversize to (18), undersize to (13).

(13) No. 1 Richards hydraulic classifier, underflow to (25), overflow to (14).

(14) No. 2 Richards hydraulic classifier, underflow to (26), overflow to (29).

(15) No. 1 jig, first side-discharge to (42), first hutch to (43), second, third, and fourth side-discharges and hutches to (19), tailing to (27).

(16) No. 2 jig, first side-discharge and hutch to (42), second, third, and fourth side-discharges and charges and hutches to (19), tailing to (27).

(17) No. 3 jig, first side-discharge and hutch to (42), second side-discharge and hutch to (43), third and fourth side-discharge and hutches to (20), tailing to (27).

(18) No. 4 jig, first side-discharge and hutch to (30), second side-discharge and hutch to (42), third and fourth side-discharges and hutches to (30), tailing to (27).

(19) Elevator to (8).

(20) 12 by 20-in. Davis rolls set close together, to (21).

(21) Elevator to (22).

(22) Trommel, 2-mm. wire screen, oversize to (20) or (30), undersize to (23).

(23) Trommel, 1-mm. openings, oversize to (24), undersize to (13).

(24) No. 5 and 6 jigs, first hutch to (42), second hutch to (43), third and fourth hutches to (30), tailing to (46).

(25) No. 7 jig, first hutch to (42), second hutch to (43), third and fourth hutches to (30), tailing to (46).

(26) No. 8 jig, first hutch to (42), second hutch to (43), third and fourth hutches to (31), tailing to (46).

(27) De-waterer, 10-mesh screen, oversize to dump, undersize to (28).

(28) Sand-box, spigot product to dump, overflow to (29).

(29) Callow cone settling-tank, spigot product to (39), overflow to (46).

(30) 5-ft. Bryan mill, through 10-mesh screen to (31).

(31) No. 3 Richards hydraulic classifier, spigot product to (35), overflow to (32).

(32) No. 4 Richards hydraulic classifier, spigot product to (36), overflow to (33).

(33) No. 5 Richards hydraulic classifier, spigot product to (37), overflow to (34).

(34) Box classifier, spigot product to (38), overflow to (39).

(35) No. 1 Wilfley table, concentrate to (43), middling to (40), overflow to (39), tailing to (46).

(36) No. 2 Wilfley table, concentrate to (43), middling to (40), overflow to (39), tailing to (46).

(37) No. 3 Wilfley table, concentrate to (43), middling to (40), overflow to (39), tailing to (46).

(38) No. 4 Wilfley table, concentrate to (43), middling to (39), overflow to (46).

(39) Callow cone settling-tank, overflow to (46), spigot product to (41).

(40) No. 5 Wilfley table, concentrate to (43), tailing to (46).

(41) Two 6-ft. Frue vanners, concentrate to (43), tailing to (45).

(42) First-class concentrate-bin, concentrate to smelter, overflow to (44).

(43) Second-class concentrate-bin, concentrate to smelter, overflow to (44).

(44) Two galvanized-iron settling-tanks, concentrate to smelter, overflow to (45).

(45) One Callow settling-tank, overflow to (48), spigot product to dump.

(46) One 11-ft. settling-tank, overflow to (47), spigot product to dump.

(47) Two 11-ft. settling-tanks in parallel, overflow to (48), spigot product to dump.

(48) One 11-ft. sump-tank, to (49).

(49) Pumped by No. 4 Traylor two-stage centrifugal pump to (50).

(50) 33,000-gal. reservoir at top of mill.

The tables and vanners are run by a 7 by 10-in. Erie single-cylinder slide-valve engine at 180 r.p.m., which also drives an 11-kw. General Electric Co.'s dynamo. The rest of the machinery is operated by a 12 by 36-in. Bates-Corliss single-cylinder engine, running at 96 r.p.m. Two 100-hp. boilers supply steam for the engines and pumps.

Owing to the sulphides being so intimately associated, it is impossible to secure a high percentage of extraction, and to secure high-grade concentrate a very serious loss is inevitable. In treating the oxidized ores a great loss is sustained from excessive dissolving out of the sulphates and carbonates.

The following percentages of extraction show the low degree of saving made on these ores:

		Concentrate,			Extraction,		
Kind of ore.	Ratio of concentration.	Au Oz.	Ag Oz.	Pb %	Au %	Ag %	Pb %
Sulphide	8.0 into 1	0.42	19.3	37.0	26.3	36.9	69.3
Sulphide	7.5 into 1	0.47	21.1	39.2	40.1	49.3	73.8
Oxidized	6.5 into 1	0.31	21.3	40.9	38.4	47.6	58.3
Oxidized	6.5 into 1	0.22	19.5	40.2	26.0	47.5	50.3
Oxidized	8.5 into 1	0.42	18.8	38.9	24.8	39.9	49.5

These figures of extraction are based upon smelter returns, which, including losses in transmission, are about 5% lower than if based on actual mill returns. This concentrate nets from the smelter about $5 U. S. currency per ton of ore as taken from the mine, which is very low compared with the total value of the metals in the ore, which at present prices as quoted in New York is about $30 U. S. currency. The ores of the Santa Barbara district will average between $20 and $30, and as the above figures on extraction are as good or better than those usually obtained, it is readily seen that the present method of wet concentration, followed by smelting, is altogether unsuited for this class of ore. Many different methods of concentration have been and are being tried, including magnetic separation, electrostatic separation, flotation processes, processes of dry concentration, and so on, but none is thoroughly successful. Since the sulphides are so intimately associated, fine grinding is necessary to release the different minerals, which is attended by an excessive amount of dust or slime, which it is impossible to treat economically. There are many hundred thousand tons of ore of this character in this district which lie awaiting a successful method of treatment, which must, in my opinion, be worked out along a chemical line of treatment, involving leaching, or fusion, or both.

TIN IN THE UNITED STATES IN 1907.

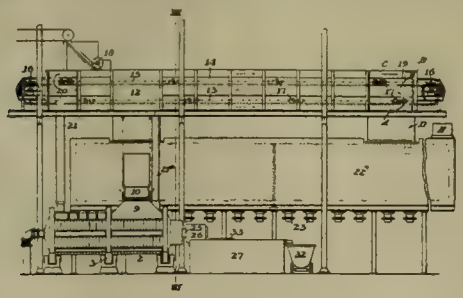
The United States uses from 40,000 to 50,000 tons of tin annually, or between 35 and 40% of the world's production, yet the supply is practically all imported from foreign countries, and in addition to the pig tin there are large importations of tin-plate, sheets of either iron or steel coated with tin. The American tin-plate industry has grown enormously during the last 15 years, but the production of tin, the metal, has been a negligible quantity. Last year it was but about one-twentieth of one per cent of the world's total production. In an advance chapter of Mineral Resources of the United States, Frank L. Hess, of the U. S. Geological Survey, discusses the waste of the metal with reference to the world's small visible supply. He says: "The recovery of tin from scrap, dross, type metal, babbitt and other antifriction-metals, bronze, and the like, is growing. The amount of tin wasted in tin cans that have been used and thrown away, and in the solder used on them, is very great, and is an extravagance which, from a broad economic view, is deplorable. Although the amount of tin ores to be drawn upon cannot be as accurately measured as the coal deposits of the world, their exhaustion seems as certain, and unless some now unrecognized substitute for tin is found, such as an economical method for the production of aluminum from clay might give, such saving will become compulsory. During the year 16 companies in the United States recovered tin amounting to 1662 short tons, valued at $914,404, while a large recovery of tin from secondary sources was also made in Europe.

In a new iron-making process, recently developed in Stockholm, the ore, coal, and other materials are finely pulverized and drawn into the furnace in a continuous stream by means of a current of air or carbonic oxide. The furnace is a vertical cylinder, with a tap-hole for the iron and an escape-hole for the gas near the base. The coal is burned to carbonic oxide in the upper part of the furnace, and the slag and reduced iron collect on the furnace-wall and flow down to the lower end.

MINING AND METALLURGICAL PATENTS.

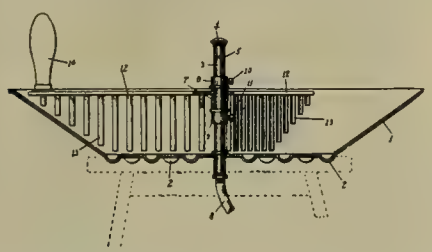
Specially reported for the MINING AND SCIENTIFIC PRESS.

METHOD OF TREATING ORES.—No. 895,939. Ralph Baggaley, Pittsburg, Pennsylvania.



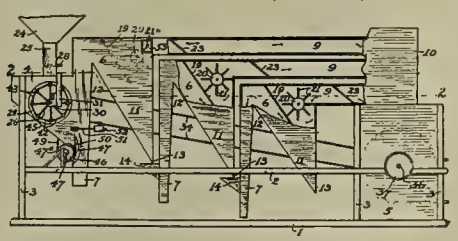
The herein described method of treating ores containing natural fuel values, which consists in first subjecting the ores to the hot gases from the furnace or converter to which they are to be fed, to thereby dry and preheat them to a point less than the fusion point of the natural fuel elements contained therein, and then delivering the preheated ores to a molten bath of matte in the converter under the action of a converting blast, whereby the temperature of the bath is maintained by the oxidation of the ores; substantially as described.

GOLD-FILTERING MACHINE.—No. 895,598. Thorstein Thordson, Oakland, California.



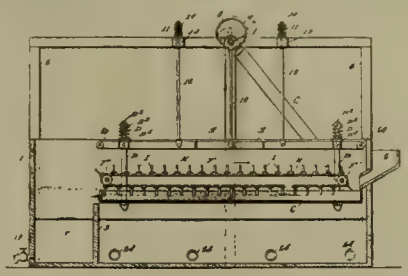
A means for effecting a dry concentration of ores comprising the combination of a pan having a plurality of pockets in its bottom, a centrally disposed tube in said pan, a cap on the upper end of said tube, said tube having air outlets directed toward said pan, a spindle slidably adjustable vertically on said tube, arms on said spindle, a plurality of agitating teeth disposed on said arms, and a handle disposed on one of said arms and spaced from said spindle, as set forth.

ORE SEPARATING AND CONCENTRATING MACHINE.—No. 895,725. William P. Clifford, Moravia, Iowa.



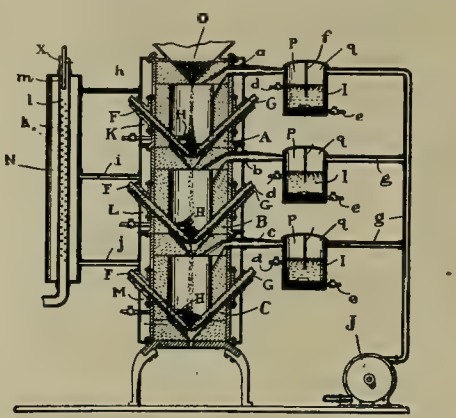
An ore-separating and concentrating machine, comprising a sizing-reel and housing, a suction-fan and housing, a plurality of suction-trunks arranged in echelon and provided with horizontal air-passages leading to said suction-fan, transverse deflector-plates mounted in said trunks and adapted to divert air-currents downwardly into the lower portions of said trunks and thence upwardly to the intake ends of said horizontal air-passages, and reels provided with plate-arms arranged to take into said air-currents whereby said reels are revolved and said air-currents are intercepted by the dipping in of said plate-arms.

ORE-JIGGER.—No. 894,604. Ephie Cohen, Joplin, Missouri.



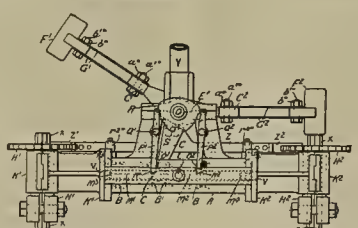
An ore-jigger comprising a tank, and sieve movable up and down in the tank, levers pivoted at their outer ends and extending inwardly over the sieve, rods connected with the levers and extending upwardly therefrom, springs on said rods, eccentrics, straps on said eccentrics and having rods connected with the inner ends of said levers, the levers being provided near their pivoted ends with vertical openings, hangers connected at their lower ends with the sieve and extending upwardly through the openings in the levers and having slots within the openings or slots of the levers, pins passing through the slots in the hangers and connected with their respective levers, springs on the upward extension of the hangers and bearing between the levers and abutments on the said upward extension of the hangers and a carrier operating between the levers and the sieve, all substantially as and for the purpose as set forth.

PROCESS OF EXTRACTING METALS FROM ORES.—No. 896,245. James H. Reid, Newark, New Jersey.



The herein described process of extracting metals from ores, which consists in successively subjecting the ore in vacuum to a series of different heating operations and condensing separately and independently the metals sublimed in each.

ROCK-DRILL.—No. 894,213. Henry J. C. Keymer, Gorleston, Great Yarmouth, England.



In a rock-drill, in combination, a pair of boring tools, means for rotating said tools intermittently, hammers for striking said tools alternately, connections adapted to operate by air under pressure for moving said hammer, valves for controlling said connections, and lever devices for controlling the operation of the valves and the operation of the tool-rotating means.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

MINING CLAIM—LOCATION AND DISCOVERY BY AGENT.

A mining claim may be located by an agent, even without the knowledge of the principal. So where a person entered on land and performed the acts necessary for a valid location of a placer oil-claim, except making a discovery of minerals, but before any discovery thereon, sold a part of such claim to another, and then abandoned the other part, and thereafter entered the employment of a third person for the purpose of locating placer oil-claims, and then entered on the same land as agent for such third person, and completed a valid location thereon by making a discovery, such discovery inured to the benefit of such third person; and the fact that such agent had previously made a location on that part of the claim for himself, except discovery, and had conveyed what interest he had in the claim to such original grantee before entering the employment of his principal, did not affect the right of his principal to the benefit of his discovery and location.

Whiting *v.* Straup, (Wyo.) 95 Pac. 849, May, '08.

EXTENT OF PLACER CLAIM—DISCOVERY.

A placer claim is limited to 20 acres for each individual locator, and the aggregate that may be located as one claim by an association of persons is limited to 160 acres. However, when more than 20 acres is located as one claim, one discovery is sufficient for the entire claim, and when a valid location is made, a legal right of possession follows.

Whiting *v.* Straup, (Wyo.) 95 Pac. 849, May, '08.

CORPORATION PURCHASING ITS OWN STOCK.

A mining corporation in Arizona was held to have the right to purchase its own stock, where such purchase was made in the discretion of the officers in good faith, and in the exercise of their control of the affairs of the corporation, for the purpose of getting rid of the superintendent, whose management was thought to be injurious, and where the corporation was solvent. In the absence of statutory prohibition, a corporation may purchase its own stock; the validity of the transaction will usually depend upon the circumstances of the case.

Copper Bell Min. Co. *v.* Costello, (Ariz.) 95 Pac. 94, March, '08.

RIGHT OF MORTGAGEE TO PERFORM ASSESSMENT WORK.

Where a mortgage on several mining claims required the mortgagor to perform the annual assessment work, and provided that on failure to do so the mortgagee, if he deemed it necessary, might do such work, and the expenditure therefor should be a further lien on the claims, the mortgagee was held to be within his rights in performing assessment work on such claims as the mortgagor failed to work upon. The fact that the mortgagor performed a large amount of work upon one of the claims was not sufficient to compel the mortgagee to accept such work as done for the benefit of all the claims, and thereby risk the chance of an adverse determination of the question as to the sufficiency of such work for all the claims.

Copper Bell Min. Co. *v.* Costello, (Ariz.) 95 Pac. 94, March, '08.

MINING CLAIM—POSSESSION.

Where actual possession was not taken by a purchaser under a contract to purchase mining claims not described by metes and bounds, such purchaser was not in constructive possession of the ground claimed by the vendor under his original location, and not included within the patents to the claims, for the reason that a person cannot be constructively in possession of property not falling within the description of some muniment of title held by him.

Butterfield *v.* Nogales Copper Co., (Ariz.) 95 Pac. 182, March, '08.

Butters Filter at Salvador.

The following letter from James S. Colbath to H. P. Garthwaite, of the Butters Salvador Mines, Ltd., gives details of great interest concerning the operation of the cyanide filter-plant at San Sebastian, Salvador:

BUTTERS SALVADOR MINES, LTD.

SAN SEBASTIAN, July 18, 1908.

H. P. GARTHWAITE, ESQ.,
RESIDENT DIRECTOR,
BUTTERS SALVADOR MINES, LTD.

RE-OPERATION OF BUTTERS FILTERS AT SAN SEBASTIAN.

"Dear Sir:—The filter is a model of convenience and, working on this slime, gives extraordinary results as compared with other installations that have come under my observation. The most remarkable feature is the capacity, due largely to the porous nature of the calcined slime. The cycle of operations for each charge of 7 tons of dry slime takes one hour and twenty minutes. Allowing for washing down, our present output of about 28 tons can be handled in 6 hours; or, making still further allowances, 100 tons can quite easily be handled in 24 hr. I doubt if this has been equalled with a 30-leaf filter. The cycle of operations is as follows:

	Min.
Filling with pulp	5
Forming cake	7
Returning pulp	5
Filling with solution	3
Washing with solution	30
Returning solution	5
Filling with water	5
Washing with water	5
Dropping cakes, draining water, and discharging, from	10 to 15
Total	1 hr. 20 min.

This is not a trial run, but what we are doing four or five times daily, without loss of time between charges. Anyone familiar with the vacuum filter will note the short time necessary to form the cakes, and the short washing period. The first could be still further reduced, by having a thicker pulp, to 5 minutes or less. The specific gravity is purposely kept below 1.29 to avoid 'freezing' cakes.

The washing period is limited by the amount of solution that can be used on the plant without precipitating especially for that purpose. The quantity passing through the filter is from 3 to 3½ tons per day of dry slime, which is, I believe, two or three times the normal quantity. The solution in the pulp assays from $15 to $20, and the residue shows from nothing up to 10c. soluble gold. The slime is given but one treatment, and the solution contains in addition to the gold dissolved from the slime, that dissolved in the pulping amounting to 2.5 to 3 oz. per ton of dry slime. To pass this directly to the filter without dilution, and reducing soluble gold to less than 10c. is certainly good work. The slime residue averages $1, and on the basis of the above figures, the extraction approximates 98 per cent.

I have introduced a few minor details, some of which may be used to advantage at other plants:

(1) Spacing; 4 in. by ⅛-in. iron discs are secured to spacing blocks on the lower face of the outside cleats, on one side only. This is to prevent the blocks from passing opposite cleats when lowering the leaf or when the frame is warped from any cause or when it shifts position, as it sometimes does, from the force of material being pumped into the box. I have found spacing-devices attached to the side of box objectionable on account of the accumulation of slime, and also when the spacing is close on account of rigidity. The top spacing is by blocks at the ends, and by irons bent into channel shape between, using two or three to each leaf. They are easily inserted and removed. The frames are held down by a single timber across the centre, resting in two sockets, one of which opens on the side.

(2) Acid-treatment; the acid-box is equipped with a vacuum-drum for circulating the acid. The leaves are treated

once each month, all on the same day, thus maintaining them in uniform condition; although as yet there has been no perceptible increase in the time to form the cakes after 30 days' run. Two men can easily take out, wash, and acid-treat 30 leaves per day with an acid-box holding six leaves. The box itself will serve twice that number per day with a vacuum-drum for circulation, and adequate equipment for washing and handling.

(3) Care of leaves; the press when not in use is kept full of solution, the object being to prevent rotting of the canvas and precipitation of lime due to evaporation. No spare leaves are in use, soaking in acid or alternately wet and dry. This practice, I believe, tends to rot and slack the canvas. Time alone will tell whether I am right in predicting smooth sailing for a considerable period, if these precautions are observed. Mr. Guthrie claims the simplest-run filter installed up to date is at San Juancito. It may have been at the time he wrote. Our filter was not finished then.

JAMES S. COLBATH.

Smelter-Smoke Consumer.

A process for overcoming the nuisance of smelter-smoke has been tried in West Berkeley, where an experimental plant has been installed by C. Y. De Lay and George C. Carson, mining engineers and metallurgists of San Francisco. The process consists of drawing SO_2 through carbon heated to a yellow heat, where the sulphur dioxide gives up its oxygen to the carbon, as well as any other oxides, such as metallic flue-dusts, and producer-gas (CO) is produced; the equation being:

$$SO_2 + 2C = 2CO + S.$$

Or, in the case of flue-dust:

$$Fe_2O_3 + 3C = 3CO + Fe_2,$$

and

$$PbO + C = CO + Pb.$$

The producer-gas can be utilized for any purpose, such as for firing reverberatories, or for fuel under boilers or in combustion engines. In the experiments thus far conducted crude sulphur has been burned, and the smoke drawn through the carbon, with the result that the sulphur is deposited as soon as the gas escaping has cooled sufficiently to allow the sulphur-vapor to drop out. Some sulphuretted hydrogen forms from the steam or hydrogen in the fuel reacting upon the sulphur-vapor. This sulphuretted hydrogen is removed from the gas by drawing through oxides of iron where it deposits the sulphur, leaving some carbon-bisulphide, which can be almost entirely removed by proper gas-scrubbers.

Another interesting feature developed in the experiments is the application of lampblack for fixed carbon. As it requires fixed carbon for the reactions, the cost of coke or charcoal would make the process prohibitive, but crude oil contains about 85% carbon and 15% hydrogen, which, when heated and burned in a chamber with only enough air to ignite the hydrogen, leaves the carbon as lampblack, free from ash. The inventor of the process hopes to develop this latter feature into a process for manufacturing coke from crude oil. A departure has been made from the usual practice in constructing a plant. Instead of erecting a shaft of steel and masonry above the surface, shafts are sunk in the ground, lined with concrete and refractory linings at the points where the temperature would fuse the concrete. A number of experiments have been made at the plant in manufacturing producr-gas from city garbage, which have proved very successful, and the inventor claims that with small changes in the details of the plant, sage-brush or grease-wood can be employed for manufacturing producer-gas. He has also found that stable manure is as easily turned into gas as is bituminous coal.

The heat equation in the recovery of sulphur is exothermic, 2221 calories being absorbed by the sulphur and 4814 calories liberated. Three-fourths of a ton of carbon will recover 1 ton of sulphur, providing the atmosphere drawn through the carbon contains no free oxygen or other oxides than sulphur dioxide to consume the carbon.

In practice any sulphur escaping in the smoke from the furnaces would pass through the carbon, which will catch or reduce all of the flue-dust, so that nearly all the solids now escaping from smelter-chimneys will be arrested and their values added to the output of the plant.

The gas produced in reducing the sulphur and flue-dust of the roasters would supply reverberatories and boilers with fuel.

Draeger Life-Saving Apparatus in a Mine Fire.

The following report is made out in addition to a report recently given by the Pittsburgh-Westmoreland Coal Co. on work done with the Draeger life-saving apparatus in the mine fire in the Schoenberger mine of the Pittsburgh-Westmoreland Coal Co. The task before the men was that of putting up four stoppings in a place about three feet high, two of the stoppings being about sixty feet from the safety-door. The work on the other two stoppings, which were nearer to the safety-door, was comparatively easy. As the place in front of the stoppings was fairly dry, they were put up in about two hours. During the progress of the work no smoke was met with, and two of the electric Draeger safety-lamps furnished all the light the men needed.

The work of putting up the other two stoppings proved to be more difficult, as the place in front of those stoppings for at least 30 ft. was a deep swamp, and rafts had to be put up, in order to enable the men to approach the place. On account of the fact that the men had to travel for this distance on small boards, in a place three feet high, the work of putting up the stoppings had to be done in a stooping position..

After the four stoppings had been roughly put up (one of the stoppings being made of brattice cloth), the supply of oxygen and cartridges ran short, and in order to make these stoppings air-tight, it was decided to open the safety-door and turn in the ventilating current, so as to enable the men to work without wearing the apparatus. Two minutes after the door had been opened an enormous amount of explosive gas was indicated by the safety-lamps, and the men were hastily withdrawn and the door again closed. We mention this fact in order to show in how strong a percentage of after-damp the men wearing the apparatus had to work. It was then decided to get fresh supplies of oxygen and cartridges from New York. After this supply had arrived in Pittsburg, the work was resumed, and in about five hours, working with the apparatus, the stoppings were made air-tight and the air turned in again in order to build a solid brick stopping.

It should furthermore be stated that the high efficiency of the Draeger apparatus was proved by the fact that the wearers of the apparatus were able to work for nearly 24 hours continuously, and during this shift they wore the apparatus for periods of nearly five hours at a time. While at first the men as a rule were withdrawn after having worked with the apparatus for about a half hour, in this trial they were able to remain in the apparatus for a full hour and more, showing that endurance of the apparatus is only a matter of some experience.

Commercial Paragraphs.

C. W. MERRILL, mining engineer and metallurgist, has opened an office at 143 Second street, San Francisco.

The GOLDSCHMIDT THERMIT CO., of New York, is constructing a new machine-shop, which will be elaborately equipped for extensive repair work by the Thermit process.

BAINBRIDGE, SEYMOUR & CO., London, announce that George B. Walker is now associated with the firm and will give his attention to reporting and advising on coal and iron properties.

EDMUND B. KIRBY, manager for the Federal Lead Co., Flat River, Mo., will retire on October 15 next, and devote his time thereafter to consulting work, with headquarters at 701 Security Bdg., St. Louis, Missouri.

THE RISDON IRON WORKS, of San Francisco, reports that the Eldorado dredge, at Diamond City, Montana, has started operations on the largest area of alluvial gravel in the

United States. The dredge is one-half mile from a famous gravel bar from which more than $4,000,000 was taken in the early seventies. The gravel in this old bench has been turned over three times, and was originally only four feet thick.

Publications Received.

Western Australia, Annual Report of the Department of Mines for 1907.

Geology of the Rangely Oil District, Rio Blanco County, Colorado. By Hoyt S. Gale. Bulletin No. 350 of U. S. Geological Survey.

Rocks and Rock Materials: A Manual of the Elements of Petrology Without the Use of the Microscope. By Louis V. Pirsson. 12mo., 419 pp., Ill. New York: John Wiley & Sons, 1908. Price $2.50 net. For sale by the Mining and Scientific Press.

Many a student and engineer in the field has longed for the freedom of the good old times of Von Cotta, when a man could with some confidence give a name to a rock when he found it. But the petrologists began to discriminate as data increased, and to insist on deference to the revelations of the microscope, until the worker in the field was afraid to even tentatively classify a rock. He scarcely had use for other terms than granitic, aphanitic, metamorphic, and the like, lest someone threaten him with confusion under microscopic evidence. Mr. Pirsson brings back our liberties. He has undertaken, with evident success, to construct tables and schemes for identification of rocks by their microscopic characters that will be in essential agreement with the classification reached from microscopic and chemical investigation. The work is a clear simple exposition of the leading facts concerning rocks and rock-forming minerals. Simple methods for determining the mineral constituents of rocks are given; general characteristics of rocks, and their relationships; causes of texture, and its significance; inclusions; border-zones; petrographic provinces; and the like, are presented lucidly; after which follow descriptions of the principal rocks, with their relations to each other, their economic significance, and their special uses when they themselves possess economic application. It is a most useful treatise, and will be a great aid in field-study.

The Design and Equipment of Small Chemical Laboratories. By Richard K. Meade. 8vo., pp. 144., Ill. Chicago: The Chemical Engineer Pub. Co. 1908. Price $2 net. For sale by the Mining and Scientific Press.

Mr. Meade is a man whose experience in fitting up laboratories certainly has well prepared him to explain, not merely the leading features, which are matters of common knowledge, but the little tricks and conveniences, and clever time-savers, which mean so much in economy of time and in accuracy of work done under the imperative demand for speed in modern industrial plants. The work covers the field adequately, giving, among other things, an admirable chapter on 'ignition,' in which so many errors are perpetually made; also the chapter on electrolysis is worthy of special note. It is, from cover to cover, excellent in its advice and suggestion, being the product of a finished chemist who knows the needs of the shop and the school. Many an assayer would do well to follow the hints given in this book on sampling and preparation of samples.

Road Preservation and Dust Prevention. By William Pierson Judson. 8vo., pp. 144, Ill. New York: The Engineering News Pub. Co. 1908. Price $1.50 net. For sale by the Mining and Scientific Press.

The automobile has revolutionized road-making. Not only does it necessitate a different road-bed to meet the requirements for endurance under the peculiar wear of the motor-car, but the prevention of dust has also to enter into the road-builder's plans. The most effective subduers of dust are oil and tar, and these are capable of meeting the requirements for durability also. Mr. Judson has written a succinct, practical little book, which should be in the hands of all persons interested in making better roads and in the abatement of the dust nuisance. The increase in the use of tar in road-making will be a great benefit to the country, through the stimulus it will give to by-product coking, thus aiding in the economy of our natural resources.

Gold and Silver. By Walter R. Crane. 8vo., pp. 737, Ill. New York: John Wiley & Sons. 1908. Price $5 net. For sale by the Mining and Scientific Press.

This is another product of the activities of the Carnegie Institution in developing a series of treatises covering the economic history of the United States. It reviews the subject of gold and silver adequately though not exhaustively, and outlines the methods of mining and ore treatment to an extent that may prove helpful to one unacquainted with such matters and desiring to obtain enough of the shibboleth of gold and silver mining and metallurgy to better comprehend the annual report of a mining company. One of the most interesting features of the work is the chronology of gold and silver mining in the United States, covering 35 pages, beginning with Ponce de Leon in Florida in 1513. The discoveries of the precious metals and the general course of development of their production, is traced by States. Elaborate tables of production are also given, so that the book will be handy for historical reference.

Catalogues Received.

The Samson Mfg. Co., Denver, has recently issued catalogue No. 3, on Samson ore-crushers.

The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio, has recently issued a new mine-car catalogue, No. 60.

The Cyanide Plant Supply Co., London, has recently published a small booklet descriptive of Brown agitators.

The S. Flory Mfg. Co., Bangor, Pa., has recently issued its 1908 catalogue, describing its line of hoisting engines.

The Union Iron Works, San Francisco, has issued a 14-page pamphlet describing copper converters and accessories.

The United Gas Machinery Co., New York, has issued a small catalogue giving typical designs for producer-gas plants.

The Triplex Roll Co., Denver, has recently issued an attractive pamphlet descriptive of Triplex rolls for ore-grinding.

The Chicago Pneumatic Tool Co., Chicago, has recently distributed Catalogue No. 26, descriptive of Franklin air-compressors.

The Rix Compressed Air & Drill Co., San Francisco, has recently published its catalogue No. 30 on Torpedo rock-drills and accessories.

Dean Bros., Indianapolis, have lately published catalogue No. 71, which gives complete description of and information concerning Dean steam-pumps.

The Western Lubricating Valve Co., Denver, has lately distributed an extensively illustrated booklet describing its line of lubricating valves for rock-drills.

The Eureka Drill Steel Co., Denver, has lately sent out a small booklet setting forth the advantages of Eureka drill steel for the manufacture of rock-drill bits.

The American Spiral Pipe Works, Chicago, has recently issued an elaborately illustrated booklet (No. 22) descriptive of spiral riveted pipe and fittings therefor.

The Goodman Mfg. Co., Chicago, has recently issued Bulletins No. 301 and 501, the first of a series which will eventually comprise a complete catalogue of electric mining machinery.

The American Steam Gauge & Valve Mfg. Co., Boston, has issued a pamphlet on steam-engine indicators, which is not only a catalogue of the apparatus supplied, but is a complete manual for the taker of diagrams.

The Bristol Co., Waterbury, Conn., has recently issued Bulletins No. 91 and 93, which, together with No. 92, issued in June, make a complete list of recording thermometers for all temperatures up to 800°F. All three pamphlets are handsomely printed in colors, and will be valuable additions to any library of trade publications.

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EDITORIAL.

ON October 1 the 95th meeting of the American Institute of Mining Engineers is to be held at Chattanooga, Tennessee. Excursions will be made to Ducktown, and these will include the two important copper mines and smelters.

THE NEW MILL of the Simmer Deep company at Johannesburg will have 300 stamps, each of which will weigh 1670 pounds. In the design of the mill, three main principles have been kept in mind, namely: Simplicity of arrangement, large units (such as 50-ft. sand-vats and 70-ft. slime-vats), and facility for extension of the plant.

METAL operators will be interested in reading the letter from our correspondent at Melbourne, Australia. We hear the echo of a growl that went round the world when Mr. H. H. Rogers and his piratical crew undertook to play with the copper market for the benefit of Wall Street. The disposal of the Broken Hill lead and the Mt. Lyell copper is a matter of some moment to the American market in these metals, therefore the gossip of Melbourne will prove timely. Our correspondent refers also to the successful treatment of zinc concentrate at Broken Hill, and his statement is confirmed by letters received by us from London.

SIGNS of impending trouble gather in the Coeur d'Alene. The convergence of a group of mining experts, including Messrs. Ross E. Browne, Albert Burch, J. R. Finlay, and W. J. Elmendorf, at Wardner, Idaho, suggests the resumption of litigation over apex rights between the Bunker Hill & Sullivan and the Federal Mining & Smelting companies. Mr. Pope Yeatman is there in the interests of Mr. Daniel Guggenheim and of peace, for the New York financier is interested in both enterprises and is likely to view with alarm the clash of the courts. Should hostilities supervene we shall see a further obfuscation of mining geology as viewed through the smoked glasses of the law and another exemplification of the insecurity of title due to the interpretation of regulations based on non-science.

IT MUST be confessed that W. R. Hearst has done a service to the country by his exposure of the venality of sundry legislators. Moreover, it is noteworthy that the fact surprised no one; just as we in San Francisco believed the former supervisors to be corrupt and yet barely hoped to see them exposed, so the average business-man understood Foraker and Sibley to be hirelings of the Standard Oil Company without the hope of seeing any end to their pestilent energy in the cause of national corruption. From Wall Street we learn that the exposure of the Arch-

bold-Foraker correspondence has "shaken confidence among capitalists," and it is whispered that disorder in the stock market is to be fostered in order to warn the public of the danger of reviving political activity against the big corporations. Thus every movement of reform is crippled, for the predatory financiers have scattered their stocks among "the widows and orphans" so that those proverbially deserving citizens have become partners with Harriman, Rogers, Archbold, and Foraker. Those who desire freedom in the throwing of stones should not live in glass houses, and the people who hope to purify national life had better begin by careful abstention from buying the shares of corporations dominated by enemies of the Republic.

Lives of Mines.

MEN think all men mortal but themselves. Miners recognize that all mines must come to an end some day, except their own. Occasionally it is well to remember even our own mortality. At times it is proper to emphasize the fact that the best of mines is a treasure-vault of a necessarily exhaustible character. As a rule it is not possible to predict the date at which a mine will be so stripped of its ore as to be a worthless hole in the ground. Where a mining property possesses ample room to follow an ore deposit on its dip or on its strike, or where unquestioned apex rights afford the opportunity to explore indefinitely in depth, the end is postponed and is reached only when either the capital or the pluck of the shareholders has been bottomed. Time and again 'worked out' mines have been rejuvenated by the skill and good fortune of enterprising operators. Thus the Gwin mine, in Calaveras county, California, was re-opened by Mr. F. F. Thomas and his friends when it lay abandoned; the Camp Bird, in Colorado, was based on a prospect started twenty years before it became a mine, and supposed to be worthless until Mr. Thomas F. Walsh took a lucky sample from the old workings; the great Nevada Consolidated copper mine was built upon the ruins of earlier unsuccessful enterprises. A rise in the price of a metal, the invention of a metallurgical process, a revival of interest in a mining district, or some other improvement in the conditions affecting profitable operation will stimulate a hope and cause an operator to expend capital in reviving a mine supposed to be dead. For these reasons men hate to acknowledge finality in the possibilities of any given mine. This swings sentiment in the opposite direction, until there is a general obtuseness to the recognition of the brutal fact that there must be a sure end to all reserves of ore. By 'ore' is meant rock containing mineral of such a kind and in such proportion as to be profitably mined at a given date. It is no consolation to a business man to hope that the ore unprofitable today will, by improved economic conditions, become a source of profit twenty years hence. Mines are rarely bought or mining shares purchased in the expectation of waiting for indefinite changes such as will enhance the value of the product of the mine. The miner lives in the present, the past belongs to the scholar, and the future to the philosopher; the man with the pick deals in actualities.

Until the Transvaal mines were developed it was not the custom to speak of the 'life' of a mine; in fact, it was deemed indelicate, as conveying a mortuary suggestion. But when it was proved that the 'banket' lodes were of unusual uniformity as regards width and value, it became a cheerful task to assure shareholders of the certainty of a life of profitable productiveness for a term long enough to change a 'speculation' into an 'investment'. Mining companies at Johannesburg own a varying number of claims; in a given area they possess a vein, or more than one vein, which they can work within their boundaries, vertically extended, but no farther. They have rights of acreage but not of apex. Given a defined tract and veins of supposedly uniform ore and of regular dip, it was easy to compute the number of tons of gold-bearing conglomerate that could be extracted; and given a mill of specified capacity, it was not difficult to estimate the number of years during which it could be kept going. Having assumed the physical factors, the investor turned to the financial side of the problem, and taking for granted a dividend at a given rate, he made provision for amortization of his capital by setting aside part of the dividend, after allowing for a net return of 6 or 7 per cent. Naturally it was easier to make calculations on paper, or estimates in a busy brain, than to find ore deposits conforming to such assumptions of lovely regularity and sweet continuity. The promoter made the most of the charming idea of a tabular lode of uniform richness that behaved with the perfect conformity of a theory in a stockbroker's text-book on geology. Thus, for example, a property consisting of 200 claims and a six-foot reef inclined at fifty degrees would yield 49,800 tons per claim, or 9,960,000 tons altogether. If the mill crushed 400,000 tons per annum, the productive life of the mine would be twenty-five years. If the revenue were thirty-five shillings per ton, the cost twenty, then the profit would be fifteen shillings, equivalent to £300,000 per annum, or a dividend of at least fifty per cent on a capital of £500,000. By referring to annuity tables the present value of ten shillings (the annual dividend) for twenty-five years is found to be £5 3s. 4d. Yes, it was lovely while it lasted, and it induced millions upon millions of money to be extracted from the British, French, and German public. But it was an iridescent dream. The arithmetic was flawless but the geology was visionary. No gold vein was ever created up to the standard of the London promoter's imagination. In the course of actual mining it was discovered that the dip of the lodes was not regular, that dislocations were caused by dikes so as to increase the cost of extraction and to diminish the tonnage available; that the ore varied in richness, being sometimes too poor to yield a profit; that the width of ore was not constant; in fine, the assumed uniformity was nonexistent; the vein-structure proved to be like vein-structure anywhere else in the world, namely, subject to breaks, irregularities, and variations such as constitute, and always have constituted, the sport of

mining. True, the Rand deposits have a persistence and even a regularity above the average, and they have furnished the basis for a magnificent industrial development, but it cannot be sufficiently insisted that the mines of the Transvaal are not *hors concours*; that they are not superior to the vicissitudes of mining; that they are not a fit subject for childlike calculations.

The experience of the Wemmer, City & Suburban, and Roodepoort United companies proved that the lives of mines, like those of humans, are subject to untimely ills, while the record of the Bonanza, Pioneer, and one or two other mines proved that properties apparently exhausted may yield ore beyond the estimates of engineers. Mining is essentially speculative, and no wise man will allow himself to hug the notion that even the best mine is either inexhaustible or accurately appraisable, any more than the 'expectation of life' to an annuitant. Estimates of the longevity of a mine must be taken with reserve; at the best they are close approximations, dependent upon factors some of which are quite beyond control. Thus, for example, statistics published in the reports of the Transvaal Chamber of Mines giving tonnages of ore available in various mines, together with the assay-value per ton, are impressive and interesting, but we venture to say that if they are compared with the results as revealed after ten years' production, there will be enough divergence to afford a text for remarks such as we have already made. Eleven mines at Johannesburg are credited with reserves in excess of 1,000,000 tons of ore, ranging in gold content from 6.5 to 11.97 dwt. per ton. The finest showing is made by the Robinson, which has 2,779,236 tons averaging 11.97 dwt. per ton, that is, a gross reserve of $33,250,000. This has been the basis of calculations that regard the ore underground as if it were specie in a bank, while, as a matter of fact, during the six years required to exhaust this treasury of nature there is a possibility of many untoward happenings, such as interruption of work by reason of labor troubles, caving of workings, fire underground, destruction of the mill, and other disasters such as are known to have happened to mines in South Africa and elsewhere. Not that we wish to belittle the splendid mine that has been the leading gold producer of the world for several years, or to under-estimate the excellence of the technical management that has placed it in such an exceptional position. We desire to emphasize the fact that gold mining, whether on the Rand or in Nevada, whether in New Zealand or in Alaska, is essentially a glorious speculation, yielding returns the bigness of which compensates for the uncertainties, the risk of which is balanced by the profits. Sure things are dangerous, for a mine whose life can be accurately appraised is most unlikely to last longer than the estimate, its value is put at a maximum, and any error is likely to be on the wrong side. The big money in mining is made by developing a young possibility into a profitable property; when a mine is finally developed, it is well to let the other fellow have the 'investment' while you look around for another 'speculation'.

James D. Hague.

OWING to special circumstances, no mention has been made in these columns concerning the recent death of James D. Hague. Nowhere is he more honored than in California; by none are his services to science and industry better appreciated than by the older readers of this journal. When he was in San Francisco last spring we noted that he had aged rapidly during the past year, and therefore the sad news that his life was ended was not as great a shock as it was to those who thought of him always as a charming personality, as temperate as he was healthy, as genial as he was philosophic. Hague was one of a group of men to whom mining in America owes a great debt; he, Clarence King, Emmons, Becker, and Raymond were the men who first gave a right direction to the application of geology in mining operations; and they did more, for they proved how great a factor character could be in shaping a successful industry. Most of them obtained their early training at Freiberg, for the Columbia School of Mines was not founded until after they had begun practice. Hague left Freiberg in 1858. In 1863 he made the first report on the Calumet & Hecla deposit of copper ore and in later years he was properly proud of having taken a useful part in so notable a mineral development. In 1867 he joined King on the Survey of the Fortieth Parallel and made important geological investigations in the West. In 1871 he became directly connected with gold mining in California, especially at Grass Valley, where he directed the opening of the North Star mines, one of the cleanest, most intelligent, and most successful of American mining enterprises. This brought him periodically to California, even after he had retired from active consulting work. Hague was necessarily an authority on all national mining problems; he served on important commissions both at home and abroad, he wrote occasionally to both the technical and secular press, and he was always to the point, careful, sane, scholarly. One of the literary productions in which he took pride was the 'Memoirs of Clarence King,' to which many notable men contributed, and which Hague edited with an accuracy and fidelity rare in these days of reckless hurry. This was published in 1904. After the disaster of April, 1906, Hague came to San Francisco as representative for the New York Chamber of Commerce, to advise concerning the use to be made of the $500,000 donated by the Chamber for the benefit of the sufferers by the earthquake-fire. He was admirably fitted for this benevolent duty, and performed it with the conscientious diligence characteristic of him in all his doings. In these days of private and public graft, at a time when the finance of mining resembles a hippodrome on the edge of a penitentiary, in a period marked by intensive pursuit of the shekel and the successful evasion of moral obligation, it is fitting to record the heritage of a fine example, the stimulus of a life that combined the skill of the engineer with the science of the geologist, the enterprise of a financier with the honor of a gentleman.

Personal.

WILLIAM M. BREWER is here.

M. L. REQUA is at Salt Lake.

W. F. A. THOMAE is in Colombia.

J. R. FINLAY is at Wardner, Idaho.

ARTHUR WINSLOW is expected here shortly.

SEELEY W. MUDD was in San Francisco this week.

T. A. CAMPION, of Chicago, is on his way to Nome.

ALFRED H. BROOKS was at Nome early in September.

PHILIP C. STOESS has gone from Seattle to Valdez, Alaska.

O. B. PERRY is expected in San Francisco about October 1.

J. W. MERCER sails from New York for Ecuador on October 15.

W. L. LELAND was in the railway accident near Nome, but was unhurt.

GEORGE ARGALL, of Leadville, Colo., is spending a few days in San Francisco.

SCOTT TURNER is remaining at Nome for the remainder of the present season.

JAFET LINDEBERG has returned from the Anadir concession, in eastern Siberia, to Nome.

HOWARD W. DUBOIS passed through San Francisco on his return from Dawson to Philadelphia.

W. J. ADAMS is in Tuolumne county, California, and will return to San Francisco on October 1.

F. W. BRADLEY is making one of his periodical visits of inspection at the Bunker Hill & Sullivan mine, in the Coeur d'Alene.

GEORGE W. BORROWE has returned from Western Australia, where he was manager of the Great Boulder Perseverance mine, and has opened an office in the Mills Bdg., San Francisco.

DANIEL GUGGENHEIM, JAMES PHILLIPS, ANTON EILERS, KARL EILERS, JUDD STEWART, EDGAR NEWHOUSE, W. R. RUST, and EUGENE B. BRADEN met at Salt Lake last week; and the three first mentioned went thence to Ely, Nevada.

WILLIAM FRECHVILLE, WILLIAM CAMPBELL, HUGH T. MARRIOTT, and J. C. MURRAY (editor of the *Canadian Mining Journal*) are among those in attendance at the meeting of the Canadian Mining Institute at Victoria, British Columbia.

J. M. BOUTWELL, who has been engaged in mining work for the Government in western districts during the last ten years, has resigned his position as geologist on the U. S. Geological Survey. He will engage in mining geology for private interests, and is now on his way from Washington to Bisbee, Arizona.

Obituary.

CABELL WHITEHEAD died at Nome, Alaska, on September 7, in consequence of injuries received two days previous in an accident on the Seward Peninsula Railroad. The train was derailed and Dr. Whitehead was thrown into a pool of cold muddy water under some lumber, which was part of the train-load. He was pinned under the lumber for a couple of minutes, so that his lungs were filled with the silt and cold water. On being extricated, he recovered sufficiently to be able to speak, but acute congestion of both lungs supervened, and a fatal result was inevitable. Dr. Whitehead was one of the most influential and useful citizens of Nome. He owed his title to a Ph.D. degree. As consulting metallurgist to the U. S. Mint he was well known at Washington. He came to Nome in 1900 as representative of the Bureau of the Mint, and shortly afterward founded the Alaska Banking & Safe Deposit Co., of which he was president at the time of his death. He made the first trustworthy report on the future of the mining industry on the Seward Peninsula; this was at the close of the summer season of 1900 and was made for the U. S. Government. He resigned from the Government service in 1901 and soon afterward organized the Topkok Ditch Co., in which enterprise he was supported by Henry Bratnober. He was born in 1863, at Lynchburg, Virginia, and was descended from an old colonial family. His education was obtained, first at Lehigh University, where he was graduated in mining in 1885, and then at Columbia University, from which he received the degree of Ph.D. His work lay mainly in the assay department of mining, first at Boisé City, Idaho, and then at Washington, D. C. In 1895 he went to Europe to investigate methods preparatory to the building of a new mint at Philadelphia. He made a special study of electro-metallurgy and contributed several valuable papers on this subject. In 1898 he established the assay office at Seattle. He is survived by his wife and he is also mourned by many friends. At Nome he was a dominating figure and played an important part in the development of the Seward Peninsula. He was manager and president of the Seward Peninsula Railroad, on which he was killed, having resigned control a week before the fatal accident. A man of fine presence, conspicuous ability, and unusual culture, it is not too much to say that his untimely end is a tragic event in the history of Alaska.

Latest Market Reports.

LOCAL METAL PRICES—September 24.

Antimony	12@16c	Quicksilver (flask)	$42@43
Casting Copper (scrap)	8½@13¼c	Spelter	6¼@7¼c
Pig Lead	4.85@5.80c	Tin	32@33½c

ANGLO-AMERICAN SHARES.
Cabled from London.

	Sept. 17. £. s. d.	Sept. 24. £. s. d.
Camp Bird	0 13 3	0 13 0
El Oro	1 7 6	1 7 0
Esperanza	3 6 6	3 4 0
Dolores	1 10 0	1 10 0
Oroville Dredging	0 11 9	0 12 0
Stratton's Independence	0 1 0	0 1 0
Tomboy	1 3 9	1 2 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Sept. 18	13.43	4.49	4.79	52
" 19	13.31	4.49	4.79	52
" 20	Sunday.	No market.		
" 21	13.31	4.49	4.79	52⅜
" 22	13.19	4.49	4.76	52
" 23	13.19	4.49	4.76	52
" 24	13.19	4.49	4.76	51⅞

MINING STOCK QUOTATIONS—NEW YORK.
Closing prices.

	Sept. 17.	Sept. 24.
Amalgamated Copper	74⅝	74
American Smelting & Refining Co	85⅝	85⅛
Boston Copper	12	13
Butte Coalition	23½	24
Cumberland Ely	7¾	7⅝
Dolores	6¼	6½
El Rayo	3¼	3¼
Giroux	3⅞	4⅛
Greene-Cananea	10¼	10⅛
Indiana Sonora	5	5
La Rose	6⅛	6⅜
Miami Copper	10	10
Nevada Consolidated	14⅞	15⅛
Newhouse	5¾	5¼
Nipissing	8⅜	8½
Ohio Copper	⅛	2¼
Tennessee Copper	37¾	38⅜
Utah Copper	41½	41
Yukon	4½	4¾

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, September 24.

Atlanta	$ 21	Laguna	$ 1.20
Belmont	1.15	MacNamara	49
Booth	39	Manhattan Con	6
Columbia Mtn	25	Midway	29
Combination Fraction	1.20	Montana Tonopah	1.00
Daisy	66	Nevada Hills	1 20
Fairview Eagle	35	Rawhide Queen	74
Florence	3.40	Sandstorm	20
Gold Bar (Bullfrog)	3	Silver Pick	17
Goldfield Con	5.87½	St. Ives	27
Gold Kewenas	33	Tonopah Extension	66
Great Bend	30	Tonopah of Nevada	7.00
Jim Butler	25	Tramp Con	15
Jumbo Extension	33	West End	52

(By courtesy of W. C. Ralston, 353 Bush St.)

General Mining News.

ARIZONA.

COCHISE COUNTY.

The Keystone Mining Co. is to be incorporated to work a group of nine claims, at Johnson camp, belonging to Alex Bannon and W. W. Miller. The capitalization is $900,000 in shares of $1 each, 400,000 of which will be placed on the market for public sale. The new Company is composed of well known Kansas men. The group, of which the St. George is the principal claim, is surrounded by such properties as the Walker & Williams, the Arizona Consolidated, and the John Gleason.

MOHAVE COUNTY.

George Fisher, of Chloride, has a contract to sink the shaft of the Horseshoe mine, at Cerbat, to the 150-ft. level. The shaft is now almost to the desired depth, and contracts have also been let to Mr. Fisher to cross-cut several veins in the Horseshoe group and also to drive 100 ft. in each direction on the vein. Work is progressing rapidly and it is the intention of J. W. Thorn, general manager of the property, to keep development on the move the next twelve months.

YAVAPAI COUNTY.

The Gold Ridge M. & M. Co. has been incorporated to work the Mark Hanna group of claims, near Congress, formerly owned by Byron Smith of Wickenburg. Mr. Smith has been appointed superintendent and has gone to the mine to start work. The property is in a practically proven belt, the Alaska and Zeiger ground both having been developed to the producing stage.——The Octave mine is undergoing considerable change in the way of surface improvements pending the time when electric power can be transmitted to the camp. The miners have all been laid off and a force of men is now employed in tearing out the boilers and doing other work preparatory to the installation of electricity. Two new head-frames are being placed on the main working shafts in order to increase the hoisting capacity. The old cages will be abandoned and skips will be used instead.

CALIFORNIA.

AMADOR COUNTY.

The Keystone, at Amador City, has been bonded by a company of Philadelphia men, and it is understood they will at once proceed with development work. There is ample capital behind the promoters. The mine has not been developed to any great depth. The Keystone is the oldest mine in the county and has been operated continuously for over 50 years, but only in a small way during the last few years.——The Gwin mine has been abandoned and all underground machinery removed. The Company is engulfed with indebtedness, although the stockholders still have faith in the mine, and it is probable that some reorganization scheme will be undertaken.——The Copper Hill mine, near Latrobe, is getting ready to ship its first consignment of rock to the smelter. Some five years ago the find was made and operations were begun. Two steam hoists are now busy bringing ore to the surface and the shaft is down 900 ft. The ore taken out of late has been getting better and the force of men has been increased until now there are 61 men on the pay-roll. Five eight-mule teams are ready to haul the rock to Latrobe, a distance of about five miles.

ELDORADO COUNTY.

The new 10-stamp mill recently completed at the Sherman mine is now crushing ore night and day, the capacity being about 40 tons per 24 hr. The mine is opened by a double-compartment 700-ft. shaft. The vein is 12 ft. wide in some places, and carries free gold to the amount of $150 to $200. A force of 25 men and six air-drills are at work. George Clark, of Placerville, is the superintendent. It is probable that the force will be doubled when the ore surplus, which accumulated while the mill was being built, is exhausted.

NEVADA COUNTY.

(Special Correspondence).—A small pump has been installed at the Hill mine and the work of unwatering the shaft is about to start.——A movement is under way to resume operations at the Woodberry mine, which adjoins the Sultana group. Machinery will be installed.——Arrangements are being made to drive Tunnel No. 7 on the South Yuba copper mine to considerable depth to strike the large orebodies exposed in the upper adit.——Practically all the men recently laid off at the Sultana mines have returned to work on tribute. About 80 are working.——T. H. Kohler has struck a large vein of milling ore on his Eagle Bird Ex. claim, at Maybert. On two other claims good bodies of ore running from $22 to $30 per ton have been proved.——The foundations for the hoist and compressor have been practically completed at the Norambagua, and within a few days the work of installing the machinery will be under way.——Henry Brout and J. R. Selfudge, of San Francisco, are inspecting the Arctic mine on Canyon creek.——A company of Pittsburg capitalists, headed by J. H. McKaig, have decided to commence operations at the Snow Point mine. George Hegarty is superintendent.——The Searchlight G. M. Co. is actively developing the Star claim with the expectation of reaching the extension of the Crown Point vein.——A. M. Gilbert of Santa Barbara has secured a bond on the Oustomah and is arranging to soon commence activities with a large force of men.——The Grass Valley and Nevada City districts are full of idle men, despite the fact that more men are working at the present time than for many years. In the Graniteville district a dearth of labor is reported.

Grass Valley, September 21.

PLUMAS COUNTY.

The Arcadia group of mines, on the east side of North canyon, has been bonded to W. B. Devereaux and son, of New York, for a period of one year. More men will soon be put at work.——Dredging at the Cash Rock is delayed by big boulders which have to be blasted. As the divers are not drill men, they make slow progress at blasting.

SAN BERNARDINO COUNTY.

A strike of rich ore was made last week in the adit on the Oro Belle No. 1, at Hart. A streak of $300 ore, from one to three feet wide, has been uncovered for a distance of over 50 ft. In addition to this rich shoot there is six feet of milling ore, assaying $15 to $20 per ton, which will be sacked and sent to the Little Giant mill, at Searchlight.

SIERRA COUNTY.

A company of San Francisco men, represented by A. D. Gassaway, has taken a bond on some 2½ miles on the east side of the Scales-Port Wine ridge, including the Hardscrabble, Poor Boy, Bon Ton, and Monitor claims. The new company will start prospecting at once and prepare for active work next spring.——The mill at the Gray Eagle mine, at Gold Point, will be started next week. Jason Frye has set the new concentrators and everything is now in first-class order. An assaying outfit was recently purchased.——Joel Bean has recently sold his gravel mine on the Scales-Port Wine ridge to a San Francisco company, which now has men at work developing the ground.

COLORADO.

GILPIN COUNTY.

The Golden Sun adit is in 1400 ft. and some good copper-iron ore is exposed in the breast. A drift has been started on the last vein cut. Heavier rails are being laid in the adit and mule-haulage is to be used in the future.——G. M. Ashmore, manager of the Smuggler property in Moon gulch now operated by the A. K. R. Gold M. & M. Co., reports that the clean-up during last week, which represented about two weeks' run in the mill, was 96 oz. of gold, which sold to the Denver mint for $19 per ounce, bringing in $1824 for the lot. Two cars of concentrate were shipped to the Denver smelters, the first car being settled for at the rate of $28 per ton, while the last car sampled $76 per ton, being of a much higher grade. Decatur, Illinois, people are interested in the property together with Mr. Ashmore, and so

well pleased are they with the property that they are going to add five stamps to their mill capacity, overhaul the mill generally, and install a 60-hp. compound engine and an 80-hp. boiler, also an air-compressor plant.——R. I. Hughes, of Russell Gulch, and B. F. Threewit, of Denver, have become interested in a lease and bond on the Hughes mine on Bellevue Mtn., and have been doing some preliminary work during the past month. They have arranged for the installation of a first-class plant of machinery, the erection of a new shaft-building, and will start actual development as soon as the machinery is in place.——Chicago people have become interested in the Coeur d'Alene mine on Academy hill, and J. F. McBride has been out from Chicago during the past week to make arrangements for starting up the property. Gus Bolander, of Black Hawk, has been placed in charge of the operations, and the first work to be done is the installation of a 45-hp. hoisting engine. The property is leased from Mrs. Catherine Cameron, of Denver, for a period of 97 years, and the operators are planning extensive developments in the lower levels, as well as the deepening of the shaft, which is now down about 600 feet.

LAKE COUNTY.

Arrangements are under way for the electrification of the new Berdella adit in the St. Kevin district. A force of men is now at work erecting a power plant near the portal. Connections will be made with the lines of the Central Power Co. which pass near the site. While this work is going on, activity in the breast of the adit is temporarily suspended, but as soon as the machinery is in place and the power is connected with it, the bore will be driven ahead with renewed energy.——Work has been resumed on the Amazon property near Twin lakes. A drift will be driven into the orebody that was opened about a year ago. The ore carries two or three ounces gold, some silver, and a good percentage of lead. Hauling to the railroad at Granite will be started in a short time, as shipping can be done from the streak now in sight. It is proposed to keep the mine open all winter.——Over in Willis gulch, a promising discovery was made in the Manhattan property a few days ago. The adit passed through an ore streak 14 ft. wide. The vein is now being followed out in several directions. Tests of the ore have been made which show it to be of good milling grade. As the property is far from a railroad, the erection of a mill is being considered.——Spruhan & Pasco, who are working the American property in Iowa gulch, have recently opened a vein of iron carbonate from which shipments have been started.——Men have gone to work on the old Ruby property in the Western Pass district, which is to be operated this winter by A. S. Sharp, manager of the Aurora mine in Iowa gulch. Mr. Sharp will continue to look after the Aurora while handling the interests of the Ruby.——The lessees of the Progressive, or Kady shaft, have temporarily quit work owing to the fact that their orebody dipped, necessitating steady pumping. A re-organization of the leaseholders is in progress, and when completed work will be resumed.

OURAY COUNTY.

A temporary decrease in force on the Atlas mill has been made necessary by the condition of the development work at the mine. It has been found that the treatment of the Klondike lead-silver ore through the Atlas mill is not paying and that a large amount of silver is being lost. Tests are being made to determine the process best suited for the ore.——The Ouray Con. Mines Co. started work last week on its Blowout adit in the Gold Belt. Only one shift is now at work, but another will be put on later.——The First National, on the western slope of Mt. Hayden, will soon start a force of miners extending its adit, to strike the big ore-shoot exposed in the upper workings. R. W. Clinton is superintendent.——The Poland, now under lease to W. S. McCarthy and E. C. Bacon, is taking out a mill-run, preparatory to making a carload shipment. The ore being broken is high-grade silver with about 7% copper.

SAN JUAN COUNTY.

It is reported that the Hamlet mill will soon be operated again. The development of the mine has been going steadily foward and a large ore reserve is now in sight.——Work has been temporarily suspended at Koehler adit because the San Antonio Mining Co. required the contractors to keep sufficient funds on deposit to meet their current expenses, thus safeguarding the interests of all concerned, most especially of the miners.——Sam Dresbach, Arthur Landry, and C. A. Marshall have taken a lease on the Anti-Periodic, belonging to Matt Salmhofer, and will begin operations at once. They expect to make some good shipments before snow flies.

SUMMIT COUNTY.

The Wellington mine, at Breckenridge, is being equipped for handling a heavy tonnage of ore. The Wellington mill is expected to be in operation at an early date. It is believed tnat the Wellington dump will bring $7 per ton, and that the shipping ores will bring something like $40 per ton, as indicated by smelter returns. The ore in sight in the property is said to amount to 125,000 tons.——The Penn Ores Co. has resumed work on the Helen property, in French gulch, in which the long adit cut a strong zinc-lead vein.——The International Co., which opened up an extensive body of lead-zinc sulphides some months ago at Robinson, and, after testing it thoroughly, closed down to take stock of the situation, is expected to begin the construction of a separating mill during this month. It has not yet been definitely decided whether to build in Summit county or at Leadville, but probably the latter will be selected as the site. The mill will include crushers, sizers, and Wilfley tables.

TELLER COUNTY.

Hoyt and associates, who lately secured a lease on the Wrockloff, at Cripple Creek, have loaded out three cars of ore since assuming the lease, which have returned the lessees from $15 to $20 per ton. The operators have not attempted to break any mineral in the property and have confined their attention to shipping the ore left in the stopes by previous operators.——A two years' lease, with royalties graded from 15 to 30%, has been granted by the Acacia Gold Mining Co. to Calfour & Maginn, of this city, on a block of the Burns claim on Bull hill. A lease on similar conditions has also been granted by the Acacia management to A. J. Busch, on a block of ground covering 200 ft. in area situated on the east side of the Wrockloff shaft and extending to the 400-ft. level. In all there are nine sets of lessees operating on the Morning Star and Burns claims of the Acacia company, and with the exception of the last two granted, all are producing.——Operations are shortly to be resumed on the Monte Cristo property on the western slope of Beason hill by the Julia V. Mining Co., owning the Henry Adney mine. A new compressor and machine drills are to be used.——A complete plant of mining machinery has been installed on the Colorado Boss by Cleaver & Sharp, of Cripple Creek. The property is under lease to Judge Wilson, of the Black Hills, South Dakota, who will start actual operations soon. The outfit consists of an electrically driven compressor and an 8 by 10-in. geared hoist, with the other necessary machinery to operate the property. The Colorado Boss is on the south slope of Gold hill.——The 100-ton ore-house at the portal of the Comanche Plume adit was completed last week.——Morris and associates, who recently secured a lease on advantageous terms from the management of the Jack Pot Mining Co., on the Mary Wynne claim on the southern slope of Gold hill, are mining ore at a depth of 55 ft. which assays from $15 to $25 per ton. The new shaft sunk from surface by the lessees is at present equipped with windlass only, but should the pay streak hold out, a steam or electric hoist will be installed. These lessees are preparing their trial shipment.

IDAHO.

IDAHO COUNTY.

Two feet of free-milling ore which assays more than $500 in gold was struck in the cross-cut from the main adit in the South Fork (Espey) mine in the Elk City district a few days ago. The ore-shoot will be developed by running a drift west and sinking a shaft. This is the rich-

est strike yet made in the mine. A five-stamp mill was put in operation a week ago. With a crude equipment Mr. Espey, the former owner, took out $2140 in 14 days. Since then the mine has been developed by a 700-ft. adit on the vein and several cross-cuts to parallel veins.——Ore said to be of the highest grade yet found on the property has been opened on the 400-ft. level in the famous Buster mine at Elk City. The discovery was the cause for much rejoicing in the camp, as it proves that the rich ore found in the upper workings holds out at depth and indicates that the same results will be achieved in the development of other promising properties in the district which have big surface croppings.

NEZ PERCE COUNTY.

There is more than ordinary activity in the Pierce district in Central Idaho. Modern methods are taking the place of crude operations of the last decade and large areas of placer ground that was thought to be entirely too flat to work under the old system by sluicing are now being worked successfully by dredge and hydraulic elevators. I. D. Cleek now has 25 men constructing the largest ditch and opening up the largest placer property ever operated in the district. This property is situated 12 miles northeast of Pierce.——The Ozark M. & M. Co., which owns the Ozark and the Wild Rose groups, has installed a new air compressor and is making progress with its lower adit, which is now in between 500 and 600 ft. The bore is being driven at the rate of five or six feet each day, and when completed it will tap the vein at a depth of 530 feet.

SHOSHONE COUNTY.

(Special Correspondence).—By far the richest and largest body of ore ever uncovered in the Monitor mine, in the Saltese district, is the huge ore-shoot on the 400-ft. level. In driving west from the shaft the work has opened up rich sulphide shipping ore for more than 30 ft., and at many points it more than fills the whole face of the drift. A cross-cut of the vein was made recently and ore was found the whole 35 ft. A bond on the property was taken some time ago by the owners of the Success mine, near Wallace. ——Five feet of ore, four feet of which is of the highest-grade shipping quality of lead-silver, has been exposed on the property of the Caledonia Mining Co. The better ore gives assays of 50% lead and from 50 to 200 oz. silver.—— At the annual meeting of the stockholders of the Laclede Mining Co., held at Wallace, it was decided to levy an assessment of 3 mills per share, to become delinquent November 16. The delinquent sale has been set for December 16. Officers and directors were chosen for the ensuing year. An encouraging report of the Company's finances and the development of the property was submitted.——Work has started on the 4000-ft. adit of the Flynn Group Mining Co.'s property at Black Bear. A small force of men has been engaged and it is not expected that a great deal of development will be done this winter, but it is the intention of the Company to install a compressor and full line of equipment and to have everything in readiness to push development next spring. In the upper workings of the mine a good showing of ore has been made, but no shipments will be started until the long adit from the railroad has been completed.——The Capitol Mining Co. has started work on a long adit which will give a depth of about 820 ft. greater than the upper workings. This Company will also install a full line of machinery in the near future. Already almost $50,000 has been spent in the upper development, and the management believes that with the completion of this adit the property will be in a position to commence shipments and to start up its own mill.——On the completion of another 50 ft. of shaft-work it is believed that the Neversweat Mining Co., a close corporation, will commence regular shipments of ore. Some time ago ore was found at the foot of a shallow shaft and the owners decided to sink deeper. Since then the shaft has been sunk about 52 ft., and the quality of ore continues to improve at such a rate that it is believed that with a little more depth the property will be on a shipping basis. For more than 12 years this mine has been operated, but until recently nothing better than milling ore has been discovered. The ore assays about $37 in lead, silver, and gold per ton, but no attempt has yet been made to ascertain the extent of the orebody. ——C. C. Titus, manager of the Panhandle smelter, was in the Coeur d'Alene district the middle of last week and made the announcement that the first furnace of the smelter would be blown in between October 1 and 10, and the second furnace about ten days later. Mr. Titus states that for several weeks the company has been buying ore and that it has already 1800 tons on hand. His visit to the Coeur d'Alene was for the purpose of closing more contracts. A force of about 75 men is at work on the smelter and already more than $75,000 has been expended on the new roasters. The new company has agreed to accept shipments of five and ten-ton lots, provided that these are made in the name of one man, so that the shippers may get the benefit of carload freights.

Wallace, September 19.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—With a higher and steadier zinc ore market a great wave of mining activity is sweeping over the district the past few weeks, and a large number of properties closed down for months are preparing to operate again. A number of zinc smelters are re-opening for the first time since the panic, and as they use the Joplin ores this move will furnish an additional reason for increased activity among the mines of this district. The new Hegeler Bros. smelter at Danville, Ill., has opened and will buy most of the ore from the Joplin field. The smelters at Bartlesville, Okla., at Iola and Gas City, Kans., have all started the furnaces after a continued shut-down. All have buyers in this territory.——The White Dog Mining Co., operating north of Webb City, started its plant after a prolonged shut-down. A thorough overhauling of the mill was made and modern improvements installed. The old level at 147 ft. will be re-opened, as well as a deeper level at 163 ft. which is rich in ore but has never been worked.——The main plant of the old Ideal, southeast of Joplin, started again after a shut-down of almost a year. Several sub-lessees have been working in the meantime.——The old Bumble Bee mine is being drained with a view to re-opening at once. This is one of the old and rich producers in the field. The ore occurs from 110 to 198 ft., and is very rich, often consisting of solid chunks of pure zinc-blende. The land has been thoroughly drilled and operated for some years. ——Marquis & Co. are re-opening the Innovator, at Prosperity. Under the former management the mine proved unsuccessful and passed into the hands of a receiver. The present Company is opening a new drift and already more than paying expenses. The mill is a 150-ton plant.——The Pittsburg-Missouri Co. has opened an old silicate deposit, in Leadville Hollow, at the 80-ft. level. A 10-ft. face of the ore has been opened, running 5 to 10% silicate and 4% zinc-blende.——A few more weeks will note the completion of a number of mills in this county, which will be ready to operate upon well developed ore deposits. Among these may be noted the Coahuila, at Porto Rico, which is almost finished. It is one of the largest in that camp and is thoroughly equipped.——A tailing mill has just been completed on the Blackberry lease, at Smelter Hill. A large pile of tailing, the accumulation of years, is awaiting treatment. ——The Thirty Year Mining Co. will soon erect a mill to treat the ore which has been opened up in East Hollow. Thirty acres are under lease and nine shafts are in ore. This is an old tract operated years ago from 60 to 90 ft. The lower levels are being opened up and rich stopes 18 to 24 ft. thick are being worked.——Mattes Bros., who have finished the development of 24 acres west of Joplin, will move the old San Gabriel mill from their lease, at Porto Rico, and re-model it to meet the different ore conditions found in the new lease. The tract was thoroughly drilled and four shafts sunk into the ore. A test was made of 500 tons which ran 7% zinc concentrate.——The Toreador Co. at Alba will re-model and use the old plant for a tailing mill and will erect a new 400-ton mill to treat the ore.

About 7 or 8 tons of ore is treated per shift. The ground has been well developed and three shafts are in ore at different levels.——Among the strikes of the past few weeks the Leonard strike of galena, at Leadville Hollow, is important. A shaft was sunk on this lease to catch the rich run opened up on the adjoining Try More lease. At a depth of 40 ft. a rich galena run was entered. The drifts of the Try More have been connected with those of the Leonard and excellent ventilation is secured for both mines.——A good deposit of galena has been struck in the Kansas City bottoms by Seibert & Risler. The run occurs at 35 ft. with a working face 8 ft. high. The zinc-blende run, which occurs below the 60-ft. level, will be opened later.——A good silicate mine has been developed in the Duenweg camp, on the Hall land. Since February from one shaft over 2,000,000 lb. have been taken and only a third of an acre has been mined. This record has stimulated interest in prospecting and a number of drills are busy. As a result a strike has been made by Henry Weyman on adjoining land where the ore is being taken from shafts sunk only two to ten feet. The silicate is good grade and several tons have already been marketed.——The Midway camp is coming into prominence again by the development work of the Florence, Osyka, Kalitan, and other companies. The Kalitan has drilled 20 acres, has three shafts in ore, and a fourth is being sunk. The deposit occurs from 31 to 81 ft., running from 15 to 18% zinc concentrate. The Osyka has developed 40 acres to the productive stage and has subleased three ten-acre tracts. Over 30 drill holes were sunk, 22 of which penetrated the ore. Dan Bristow and associates are developing one tract and are treating the ore on hand jigs. Two to three tons per day are turned in. Dick Blosser is drilling a second lease of ten acres, on which some rich strikes have been made. A third sub-lease is being developed by Snyder & Watkins, who will erect a mill. This lease embraces the old Cardinal tract. Two shafts are in ore.——In the Carthage camp the Carthage Investment Co. is pumping the old Cholwell tract preparatory to re-opening it. A 15-ft. face has been opened in a drift running as high as 25%. The mill has been on the ground several years and is equipped with all necessary machinery. Operations will be begun as soon as the ground is drained. The Vesuvius mine, northwest of Carthage on the Davey farm, has been paying large dividends in spite of the hard year. Since last February the mine has produced 4,249,790 lb. of zinc-blende bringing an average of $34.87 per ton. Out of this $37,280 in dividends have been paid.

Joplin, September 19.

NEWTON COUNTY.

(Special Correspondence).—A contract has been let for the erection of a new 250-ton mill on the Granby M. & S. Co.'s land, at Granby, to take the place of the old plant which has been in operation about 25 years. Special devices will be used to handle the silicate ores found abundantly in that camp. About 7% was formerly lost in the tailing owing to the lack of adequate equipment.——The Little Boss Mining Co. has developed one of the best mining tracts in Granby during the past few months. A heavy tonnage of ore has been shipped weekly and the ground is developed to the stage where a mill is required. The contract has ben let for a 100-ton plant to be erected at once.——A good strike of galena and zinc-blende was made a short time ago on the Miller land, near the Henderson mines. Several drill holes were sunk striking ore from 14 to 25 ft. Drifts are being driven at the 25-ft. level. Four sub-leases have been taken and the ore is being milled in custom plants.

Granby, September 19.

MONTANA.

The Montana Mine Owners' Association has recently sent out a frank statement in answer to criticism relative to its apparently secretive business methods. It says in part: "It may be definitely stated that the fullest information has been at all times furnished to the individual members as to the plans and work being carried on by the officers and executive committee. As to giving general publicity to the work the press and general public must bear in mind that the association, in its efforts to secure more favorable smelting rates, is opposed by trusts of unlimited capital and great experience in the art of business intrigue and diplomacy of the Machiavellian school, and the making public of the plans being carried out would have put into the hands of the oppressor the power to circumvent and defeat their accomplishment.

"At the time of the organization of the association the conditions surrounding the new smelter located at Ponderay, near Sand Point, Idaho, seemed propitious for the association assuming its control and management and its officers and executive committee energetically entered upon the accomplishment of this plan. While the purpose of carrying out this plan was not fully realized, a contract was entered into by the association and the Idaho Smelting & Refining Co. under the terms of which the ores of members of the association were to be treated at exceptionally favorable rates, both as to low smelting charges and deductions and penalties. Recently Thomas L. Greenough, vice president of the association, and others, have secured a controlling interest in the smelter, and one furnace is now in operation and the second stack will be completed and blown in within 30 days, there being several thousand tons of ore in the bins to supplement the large daily output of the Greenough mines. This new organization has assumed the above contract with the association and its members may now avail themselves of its favorable terms. The successful carrying out of these plans has caused the trust smelters to reduce their charges over 30%, but this reduction does not, by a large percentage, meet the advantages available to the members of this association by shipping their ores to Ponderay.

"The iniquitous method employed in the classification of railroad lands through the mineral belts of Montana were made so manifest at the meeting of the association that a committee was authorized to proceed to Washington and present the matter to the President and the Interior Department. The committee went to Washington immediately and won a most signal victory, resulting in the suspension of the issue of all patents to the Northern Pacific railroad until the matter can be investigated and a remedy applied, in the furtherance of which the committee is still engaged.

"The matter of the inequitable rates charged by railroads for the transportation of ore was presented, in form of charges, by the association before the Montana State board of railroad commissioners. The hearing lasted four days, the association being ably represented by T. J. Walsh, of Helena, who generously volunteered his services. The matter is still pending before the board and there can hardly be a question but that the result will be a re-adjustment of rates upon a more equitable basis.

"Thus far the work of the association has proved of incalculable advantage to the mine owners and operators of Montana and is a guarantee that greater good can be accomplished if all in interest lend their aid to the efforts of the officers of the association, none of whom are now receiving any compensation for their services.

"Legislation is needed, and can be had upon the demand of the association to properly protect the rights of mine owners and operators against unjust and unlawful encroachment of other interests of far less value to the development of the State."

NEVADA.

ESMERALDA COUNTY.

The Goldfield Con. Mines Co. has decided that no more leases will be given and no extensions of existing contracts granted. The big mill will soon be ready to start, and it is the desire of the Company to do all work by company account. There are 32 sets of lessees on the Consolidation estate, and all will strive for a record production from now until the end of their respective contracts.——Prior & Quinn have been granted an 18 months' lease on the Sandstorm, at Goldfield. The block is an unusually large one, and embraces 500 ft. on the Kruger and 600 ft. on the Magnolia

claim. One of the concessions is the use of the Kendall shaft.——The R. M. Maloney lease on the Atlanta has been extended for nine months. The consideration is that the shaft, which is now 300 ft. deep, be sunk to the 500 ft. level. The leasehold is block five of the Atlanta claim.——Reports indicate that Rawhide is rapidly building up and that all lines of mercantile business are represented, and that many fire-proof buildings are going up.——After a shut-down of several weeks, owing to financial difficulties, work has been resumed on the Terrell & Cosser lease on the Hat claim of the Blue Bull Mining Co. This property has been working for the past three years. The shaft is down 400 ft. and is in a big dike of low-grade ore.——It is rumored that the recent shut-down of the Elks Con. lease on the Yellow Tiger was because of a strike of good ore, accompanied by a considerable quantity of water, making necessary the installation of pumping machinery.——The mines of Goldfield produced during the week ending September 19 a total of 2461 tons, of an estimated value of $168,450. During the same period the Tonopah mines produced 5030 tons, estimated to be worth $135,900.

NYE COUNTY.

Manhattan is excited over one of the boldest cases of high grading that has ever occurred in Nevada. The amount involved is not so great, but the method adopted challenges attention. One night last week the Shea lease on No. 9 was visited by unknown parties, who started up the gasoline hoist and took from the drift at the 50-ft. level 26 sacks of high-grade ore estimated to be worth somewhere between $1000 and $1500.——The work on the Mizpah shaft of the Tonopah Mining Co. is progressing favorably, the three-compartment shaft having been lowered 15 ft. during the past week, now being down 1195 ft. The formation shows no change, being still in dacite. The shaft will be continued to the 1500-ft. level, where a station will be cut and cross-cuts sent out to prospect the ground at that depth.——The double-compartment shaft being sunk on the Gold Ridge, at Manhattan, is now down 45 ft., and at that depth the iron gossan has been cut and a mineralized schist has been struck, showing free gold.——The Mineral Hill shaft, at Manhattan, has been emptied of water and sinking has been resumed. The shaft is at present 236 ft. deep, and a contract to sink 200 ft. deeper will soon be let by the company.——Murphy, Feike & Sweeney have made a rich strike in the adit on their lease at Telluride. The quartz shows gold in abundance, and is said to be 14 in. wide. The streak is widening rapidly and promises to develop the most important orebody in that district.

WASHINGTON.

STEVENS COUNTY.

(Special Correspondence).—The North Star M. & M. Co. has found a vein of free-milling ore, about four feet wide, in an adit now in 176 ft., at a depth of 57 ft. The ore exposed averages about $8 per ton and is similar to that found in the open-cuts.——The Blue Grass Gold, Silver, Copper Mining Co. has been organized at Orient, with J. J. Noel as president and G. A. Dahl secretary. It has purchased the Katie and the Mountain Chief group of claims, on Toulou Mtn.——Men and supplies have been taken to the Summit mine, five miles north of Orient, where work has been resumed.——New work is in progress at the First Thought mine, and ten additional miners have been put on. ——The Second Thought Gold Mines Co. has resumed work. ——A fine new body of copper-gold ore of shipping value has been discovered in the Copper-Butte mine, on Toulou Mtn.——Ore is being delivered to bins at the Globe mine for immediate shipment.——At the Beecher mine a new camp has been laid out, and the lumber for buildings is on the ground. Additional miners have been put to work. Ore is being sorted for immediate shipment. Ore bunkers and a new sorting house are under construction, and new wagon-roads are being built, to facilitate shipping. The main shaft is down over 100 ft., and a drift is being driven on the rich stringer, from 6 to 18 in. wide, samples from which run as high as $29,066 per ton, the average assays being over $100 per ton. What is supposed to be the main vein is a contact, about 75 ft. wide, between porphyry and diorite, distant from the main workings about 100 ft. The Company is considering the purchase of a compressor and other new machinery. John Gilpin, of Orient, is superintendent.——Work is to be resumed at the Tenderfoot mine, near Marcus, on Sulphide Mtn., and P. W. O'Brien, who is superintendent, has hired men for that purpose.——In the Last Chance mine, in Newport district, about six miles from Newport, a 4-ft. vein has been struck, the ore from which assays $60 per ton in silver and lead.——The Deer Park Mining Co. has been incorporated, with A. M. Wood, president, and F. E. Haskin, of Deer Park, secretary. It has taken over a group of tungsten claims 12 miles north of Deer Park. In the past three weeks work has been started on a 4-ft. vein, which carries 9 in. of solid wolfram crystals. The Company hopes to be shipping soon.——Work will be resumed shortly on the Robina mine, near Bossberg, and the employment of a large force of men is talked of. There are about 100 tons of silver-lead ore on the dump, ready for shipment. The mine lies within a mile of the Spokane Falls & Northern railway siding, at Bossberg.

Orient, September 19.

MEXICO.

The management of El Favor mines at Etzatlan, Jalisco, is considering the installation of 250-hp. gas producers, to be used until such time as electric power is available. The first section of the mill is to be ordered soon. It will have a capacity of 100 tons. A complete compressor plant has recently been put in at the mine.——The Roosevelt mine, at Guanajuato, has been sold by E. J. Kimball to W. D. Middaugh. The mine is south of the Pinguico on the same vein.——The Philadelphia Copper & Gold Co., owning the San Vicente mine at Ameca, Jalisco, will install a 10-stamp mill and concentration plant in place of the present equipment and later a smelter to take care of the ore and concentrate. M. J. Slattery, of Philadalphia, is the manager.——Cia. Minera Franco-Mexicana has been organized to operate in the districts of Jalacingo and Jalapa, in the State of Vera Cruz. The principal stockholders are Guillermo Voge and Alberto Schuller.——The San Javier Co. Jacalitos, Son., has recently taken over the Creston and California mines and is planning to erect a small smelter to make matte. Jacob J. Smith, 189 La Salle street, Chicago, is the manager.——The work of repairing El Cubo mill is proceeding slowly while work on the extension of the adit is being forced. Gerald Reaves, who is manager, says that just as soon as the adit reaches and uncovers a satisfactory orebody, the projected 60 stamps and cyanide plant will be begun. The site for this has been chosen and acquired and the necessary funds are in the treasury of the company. The little town of Cubo is entirely dependent on this one property, so that the commencement of construction of the new plant will meet with genuine approval of its inhabitants.——C. D. O'Brien, Jr., and H. H. Kenkel, of Minneapolis, Minn., have taken a bond on the old Garrochas copper mine, in the Ameca district of Jalisco, and will start development at once. In last April H. N. Canoll, of Guadalajara, took the mine under bond and lease, and at once installed $30,000 worth of machinery, including a 40-hp. hoist. Mr. Canoll sunk a two-compartment shaft for 98 ft., and the new owners will deepen it.——A controversy that has caused a long delay in the plans of the Rosario Mining Co., of the Bolaños district of Jalisco, was settled a few days ago by the Department of Fomento in favor of the American concern, and extensive work will now be started. The controversy resulted from denouncements made last year by Faustino Salcedo, the stamp agent at Colotlán, which denouncements covered some of the principal ground of the Rosario company. A protest, accompanied by titles and maps, was filed with the Department of Fomento by the American concern, and finally a decision denying the Salcedo denouncements was handed down. Since the controversy opened no work has been done by the Rosario company.

Special Correspondence.

MELBOURNE, AUSTRALIA.

Financial Reaction.—Large Combine of Metal Producers.—Attitude of Broken Hill Proprietary. — Influence of Labor Party. — Cost of Producing Lead. — Change of Metal-Content of Ores. — Progress in Zinc-Concentration Methods. — Smelting at Port Pirie.

The world of Australia has suffered from financial reaction, and it takes its 'gruelling' badly. Four years of high-level prosperity should have made its people contented and happy, but they now grumble at H. H. Rogers and another who engineered a certain copper deal and then looked on. What they wanted was that the metal market should have been kept booming and that the London Stock Exchange should have stood at fever heat, so that they could have had the delightful experience of our pastoralists, high prices and a big wool-clip. However, as the consumer took a hand in the deal to the discomfiture of the copper bulls they now want to be told that purchasing is to be started on a large scale again and that prices are going to soar once more. The decent portion of the press preaches patience and disbelief in statistics of production and consumption of the metals. In the midst of all this comes the whisper that another metal-combine is in the air. European lead producers are said to be fathering the movement. Australia is wanted to put in the Broken Hill mines, so it is said, but the big people of the field will want definite and favorable proposals to be made before they tie up their output, though they have decided to be represented at the conference. The Broken Hill Proprietary Co., for instance, has practical control of the trade with the Far East, and would require a very sound guarantee that such trade was to be held for it before it would so much as move a little finger. This is quite apart from the ability of any combine to outrage the law of supply and demand for any length of time. Some of the Broken Hill Proprietary men belong to the Mt. Lyell Co., and the way that concern was stranded in the United States over sales of its blister copper during the copper-market crash last year sets these people against an alliance with any combination, even inside their own territory.

Then the Australian labor party is a factor. It would invoke Federal legislation against restraint of trade should there be danger of throwing miners out of work. No one outside of Australia can realize how parties are swayed to do the will of the labor leaders. Mining men here, however, have measured their strength and know that it will be used without restraint. The mines, as a matter of fact, are virtually owned abroad. That fact, according to British ideas, would convey the right to act as the owners might think fit. The contrary, however, is the case, for outside ownership is regarded in Australia as foreign, and no mercy would be shown. The 'new protection' policy of the country aims at passing on to the worker some of the benefits that are supposed to accrue to a country under a protective tariff. New protection is the great plank in the platform of the worker, and trade combinations that fail to recognize it are brought to heel. Why, therefore, should an outside combination escape? The wage-question has to be reopened in a short time, as all the Broken Hill mining companies want to review the agreement conceding the employees 12½% increase in wage to the end of 1908. A jump in the price of lead would mean the postponement of that issue, because the men are not likely to consent to go back to the old scale unless they are convinced that work cannot be carried on at a profit.

Recently three big Broken Hill companies have brought out their balance sheets. These are the Proprietary, the South, and the North companies. The figures in the case of the first two are appalling. For the six months ended May 31, 1907, the Broken Hill Proprietary Co. earned over £300,000 net profits. For the same period this last half-year the total is down to £22,750, with 100,000 tons of ore treated. In the six months lead never went below £13, and as the chairman of the Company declares that the Company cannot make a profit with lead at under £13 15s. per ton, it is apparent that a good portion of the profit has come from the sale of zinc concentrate. With the South company, which today claims to be the biggest mine on the Barrier range, the profit was down to nearly £5000, and the North company to £17,000, as compared with £56,000 twelve months back. The cause of this collapse is not the price of lead, for during the fiscal half-year of this Company that metal averaged about £13 14s., but lies in the higher labor charges, the extra cost of supplies due to the tariff, and, last but not least, the heavier smelter charges imposed by the metal-buyers. These purchase for European smelters, and the latter having grown tired of doing work for nothing, save what was to be made in speculation in the metals, have jumped their charge from 85s. to 95s. Another fact is that, despite the statement published again and again that the metal content of the ore improves in depth, the reverse is the fact. There may be temporary enrichments, but the ore gets poorer in lead, though the change is very gradual. Still, that there is a falling off is unquestionable. In the Block 10 mine, which is working the deepest lift on the field, the sulphide is exceedingly close-grained and hard, and has to be practically slimed to ensure decent recovery. The zinc content also is higher.

Broken Hill, Australia, During a Dust Storm.

The great development of the field, however, has been the progress made with the separation of zinc-blende. At the Proprietary the Delprat acid process is relied on, and it gives a 45% zinc concentrate. At the Central mine the Cattermole, an oil and acid process, furnishes a 46 to 47% concentrate, and its rival, the Elmore process, worked by the Zinc Corporation, has achieved a 48% concentrate. More than that, it gets a fair lead and a high silver concentrate by vanning the zinc concentrate from the Elmore plant after flashing off the oil. Near by, also, the De Bavay water-process gets a 47% concentrate at a low cost. Therefore it is fair to say that the zinc industry is at last established at Broken Hill, after a decade of the most persistent experimenting. Costs have still to be determined, but that hard fact sticks.

The last additional fact to be told is that the experimenting of the Broken Hill Proprietary Co. with the smelting of

zinc, carried on with one unit at Port Pirie on a working scale, has been successful. The next move of the Company will be to begin the erection of other units. The desideratum is calamine, but even with that absent the European expert is understood to be satisfied that it will pay the Company handsomely to engage in the enterprise.

MEXICO.

Oil Gusher at Ozuluama.—Extinguishing an Oil Gusher on Fire.—Oil Concession in Chihuahua.—Mines at Terrazas Sold.—Veta Colorada Co., Parral, Re-organized.—Revival of Work at Santa Barbara and Sahuayacan.—Developments in Oaxaca.

That "'tis an ill wind that blows nobody good" has been well exemplified in the case of the gusher oil well of S. Pearson & Son at Dos Bocas, near Ozuluama, about 60 miles south of Tampico in the State of Vera Cruz. On July 4 this well unexpectedly burst forth, blew out the casing, caught fire from the boiler of the drilling machinery, and for two months was a great spectacle. At times the burning oil shot into the air a distance of 1000 to 1500 ft., and as high as 75,000 bbl. of oil may have been consumed every day, so that the total loss to the owners has been enormous. An immense crater, about 100 yd. diam., formed around the mouth of the well, earth was banked around it to prevent the spread of the burning oil, and every known expedient resorted to for checking the flow of oil and extinguishing the fire, but the great heat made it almost impossible. Success was at last attained by the use of powerful centrifugal pumps hurling volumes of water and sand into the centre of the crater, so that the fire has been extinguished, and though the flow of oil continues, immense tanks are being constructed to catch and store it until the hole may be completely closed. When this is accomplished another well will be drilled as near as advisable to the old hole in order to strike the same body of oil. The great force of this gusher has shown the possibilities of the region, and several large companies have entered the field and are endeavoring to obtain ground on which to drill. It has also given an added impetus to oil prospectors in the States of Tamaulipas, Vera Cruz, and Chiapas, particularly in the Huasteca fields of Vera Cruz and the Pichucalco district of Chiapas, and also in Lower California. At this time there has been made public the Government concession given to Alberto Terrazas, of Chihuahua, which conveys to him the exclusive right for a period of years for the exploitation and development of oilfields in the extensive mining districts of Iturbide and Camargo, in the State of Chihuahua.

Last week mention was made of a deal pending for the purchase of the Rio Tinto Mines & Smelter, at Terrazas, 25 miles north of the City of Chihuahua, from Gov. Creel and associates by Corrigan & McKinney, of Cleveland, Ohio. It is now understood that the deal has been consummated and the properties turned over for $187,000 gold. As the new owners have other large interests in Terrazas, and can produce a large tonnage of both lead and copper ores, it is quite probable that smelting operations may be resumed at the Terrazas smelter in the near future by Corrigan & McKinney. The entire work is in charge of R. B. Hutchinson at Terrazas, Chihuahua, Mexico. It is not at all improbable that Corrigan & McKinney may have to take over the Concheño mine and mill, in the Ocampo or Jesus Maria district of western Chihuahua, which was sold last year to the Greene Gold-Silver Co., but on which payments have not been completed. Martin J. Condon and associates held the option on the above mentioned Rio Tinto mines and smelter until recently, but forfeited their rights by failure to meet payments because of the financial stringency. Perhaps for the same reason they practically suspended operations on the Veta Colorada Mining & Smelting Co., of Parral, Chihuahua. They have re-organized the latter Company, and it is understood that ample funds will be forthcoming to resume operations immediately. The Hinds Consolidated Mining Co., at Santa Barbara, Chihuahua, is to resume operation also within the coming month. The visit in the early part of August by the Pittsburg stockholders of the Sahuayacán Mining Co. to the properties in western Chihuahua has resulted in the determination on their part to re-organize, raise the necessary funds for a larger equipment, and resume under the efficient direction of the present manager, George E. Howard, of Sahuayacán, Chihuahua. This will be gratifying news to everyone in this part of Chihuahua, for the past shipments from this property have proved its richness, and it has only been lack of equipment that has prevented the Sahuayacán mines from attaining the position they deserve.

Re-organization seeming to be the order of the day, it is understood that the New York and Boston bondholders of the Oaxaca Smelting & Refining Co., who bought in the Oxaca plant for ₱275,000, when it was sold at auction last July, have re-organized and will soon take steps to protocolize in Mexico so that operations at the smelter may be resumed by the end of the year. It will probably be controlled by the Boston interests with H. M. Holbrooke in charge of the financial end at Oaxaca. Boston capital has also entered the Taviche district, and through A. B. Foster has bought the Santa Catarina, on which more vigorous work will soon be initiated. The San Juan de Taviche Co. is preparing to sink its shaft an additional 100 ft. It is believed the affairs of the San Juan-Ejutla railroad, construction on which has been delayed by reason of a mortgage, have been straightened out so that the road may be pushed to an early completion. Work in the adit of the Humboldt mine of the Commonwealth Mining Co., of Boston, situated in the Ocotlán district, continues to give most encouraging results and a mill will probably be erected on the property early in the coming year. The ores are silver, and a very rich deposit was cut in July last.

Gov. Damian Flores recently visited the Taxco district, Guerrero, and inspected the smelter of the Cia. Met. de Juliantla, and the concentrator at Atlixtac. In view of the needs of the expanding mining interests of this region the Governor promised that in place of the mule trails now existing, a graded automobile road would be made from Taxco to the Naranjo station of the Cuernavaca branch of the Mexican Central Ry. before the next rainy season, which begins in June. The Juliantla mine is now employing over 250 men. Extensive work is also in progress in the Golondrina and Acatitlan mines. A new corporation, organized in Mexico under the name Cedral y Anexas, will develop the Zumpanquahuil mine.

CHICAGO.

Visit of Foreign Coal-Mine Inspectors. — Coal-Trade and Market.—Search of a Good Western Coking Coal. — Purchases of Coal Lands by U. S. Steel Corporation and Solvay Process Company.

Illinois and Indiana were favored last week by a visit from the party of distinguished mining engineers now visiting the coalfields of the United States under the guidance of J. A. Holmes of the Technologic Division of the U. S. Geological Survey. The gentlemen were Capt. A. Desborough, H. M. Inspector of Explosives, representing Great Britain; M. Victor Watteyne, Inspecteur Général des Mines of Belgium; Herr Conrad Meissner, Geheimer Ober Bergrat u. vortragender Rat im Min. für H. und G. of Prussia; with Messrs. E. A. De Laney, R. T. Chamberlin, and L. W. Manning of the U. S. Geological Survey. Thursday was spent at Terre Haute, Ind., visiting the Richards mine, in company with G. H. Ashley and E. F. Lines, who are engaged in making the re-survey of the Indiana coalfields. Saturday the party was taken in charge at St. Louis by President G. W. Traer and representatives of the Illinois Coal Operators' Association, and the State Geological Survey, and carried in a special car to various mines along the line of the Illinois Traction Co. A particularly careful inspection was made of the Consolidated No. 14, at Staunton, under the guidance of General Manager Schmick and Chief Engineer Smith, and of the Peabody mine at Sheridan, near Springfield. In the evening they were handsomely entertained at the Springfield Country Club, after which they

left for Cardiff on the private car of Mr. Delano of the Wabash railroad. Saturday was spent at the Cardiff mine, the day ending with a dinner at the Chicago Athletic Club, attended by representatives of the State, the operators' association, and the technical press. The party left the same evening for Wyoming and other Western States, to continue their studies of American mining conditions, expressing themselves as highly interested and pleased with what they had seen in the Middle West. It is understood that they are to make a report to the Secretary of the Interior after the trip, and to make recommendations regarding investigations to be conducted at the new Government laboratory at Pittsburg. The gentlemen made an excellent impression, and it is the opinion of the operators who met them that this co-operation between the testing laboratories of the four countries represented is certain to be productive of far-reaching results, as well as of great economies. As a portion of the same general plan, Geo. S. Rice, formerly of Chicago, but now connected with the U. S. Geological Survey, is spending this summer abroad, studying the methods and results of the foreign stations. He was recently present at a series of coal-dust demonstrations at the Altofts (England) station, which blew up timbers and a testing cylinder quite like a regular mine explosion.

The coal trade and market continue dull, but in the meantime some of the railway mines are making records in production. The latest claimant to honors of this sort is the Superior Coal Co., of Gillespie, a Company affiliated with the Chicago & Northwestern railroad. The record is as follows:

	Aug. 24.	Aug. 25.	Aug. 26.
Mine No. 1.....	3270	3276	....
Mine No. 2.....	....	3019	3015
Mine No. 3.....	....	3601	3619

It should be remembered that this tonnage was hoisted in an 8-hr. day, and that none of the mines is more than four years old. The mines are about 350 ft. deep, and are equipped with first-motion 24 by 26-in. engines. J. W. Miller, the superintendent, has the distinction of having hoisted 3000 tons in one shift from one of these mines within 12 months after breaking ground. One big factor in such operation is the steady work and assured output which the relation to the railway gives.

The effort to find a good coking coal in the Middle West continues. As is well known, the Middle West coals are generally dry and free-burning, besides which they contain too much sulphur to compete with Eastern coal in the coke market. The more careful and frequent sampling and analysis now in vogue has brought to light certain areas within which the sulphur is low, and by washing may be made still lower. Experiments continue with various types of ovens, and it is hardly to be doubted that sooner or later a local supply of coking coal that will at least be usable, if not entirely satisfactory, will be found. This summer experiments have been carried on at Linton, Indiana, and Sesser, Illinois, in both cases, it is announced, with excellent results. At the latter point the work was done by A. W. Belden of the coal-testing plant at Denver, and a very good coke is said to have been made with beehive ovens. How seriously this proposition is taken is evidenced by the fact that both the U. S. Steel Corporation and the Solvay Process Co. are known to have purchased considerable holdings of coal land in southern Illinois within the last few years.

Development in the Illinois oilfield is going forward slowly, as a result of the usual over-production. Not even the Standard Oil Co. is able to care for the net production at the rate it was coming in, so that temporarily drilling has almost ceased. While this makes it necessary for some fee and lease holders to postpone for a little the accumulation of a fortune, it is undoubtedly a good thing for the territory as a whole, as it will prevent waste and hold up prices. Meanwhile the Tidewater people have a large force of men at work laying a competing 10-in. pipe-line to the east. Small wells continue to be brought in throughout the western part of the State, but nothing of much importance has yet developed.

JOPLIN, MISSOURI.

Revival in Prices.—Smelters Resuming.—Developments in Oklahoma.—Change in Leasing Policy by Granby Co.— New 250-ton Concentrator to be Built.—Steam-Shovel Work in Zinc Mining.

During the past month there has been a revival of mining in the Missouri-Kansas zinc district, due in a large measure to the increased price of ore, which in the case of lead was in excess of $60 for the month, while zinc ore sold upon an average base of $36 per ton of 60% metal. On all grades of ore sold the average price was $2.30 more per ton than that received in the previous month. Zinc ore has sold for $40 per ton the past month, for the first time in many months. Under this stimulus conditions have improved materially. These conditions are manifested, too, in the increased demand for zinc ores through the starting up of five of the different smelting plants in the Kansas, Oklahoma, and Illinois zinc-smelting centres. At Gas City and Iola, Kansas, the smelters have fired up two additional furnaces; at Bartlesville, Oklahoma, two furnaces have been fired up; and at Danville, Illinois, the new plant of the Hegeler Bros. has been completed, and is now ready for operation. Preparations are also in progress to re-open the Ozark Zinc Oxide plant at Joplin. During the past week all the buying agents for the smelters became active, with the result that ore is now bringing $37.50 per ton of 60% zinc.

These conditions have already been strong enough to absorb the major portion of the big surplus of zinc ores that had accumulated in the district since the lower prices of last winter and spring. In the district at the present time the total surplus is about normal, or slightly in excess of 5000 tons, all of which is held by strong companies for at least a $42 base. Despite the better tone of the market, however, few of the mills in the sheet-ore belt have resumed operation. Preparation has been made by a number of mills to re-open in the event that the market should reach $40, but anything like a hasty recovery of production cannot be expected for several months. So many of the mines have allowed the water to rise on their ground and flood the drifts that the pumping proposition has become a greater problem than it was a year ago. One prominent mining engineer, in charge of two of the largest and most productive tracts in the district, avows that the water-level this year on a general average is 10 ft. higher than last year.

In contrast to the inactivity of the large sheet-ground mills, the development of the soft-ground deposits during the past year has been a prominent feature. In the Miami camp, in Oklahoma, seven new mills have been put into commission. West of Joplin two new mills are completed, and a third is building. Six new plants have been erected in the Webb City camp, while five new plants are to be erected in the Duenweg field. One of the most important movements recently has been the announcement of the Granby Mining & Smelting Co. of a change in its system of leasing lands to operating companies and individuals. Formerly the company pursued the plan of assisting the small lessee to develop a mine by providing machinery and supplies, and paying the lessee $1 per foot for sinking the shaft. This enabled anyone to take up a lease and work it. In return the Company demanded a higher royalty and the option of purchasing all the ores. As the mine became a producer the cost of the supplies and contract price was deducted by installments until the whole cost had been refunded to the Company. In the event the shaft did not strike a paying orebody the Company lost all it had put out and the lessee was exonerated from any financial responsibility to the Company. This system had made Granby renowned as the best poor-man's camp in the district. With the change of policy the Company gives no assistance, but leases to operators upon a straight royalty, and the ores are sold in the open market. Neither are the leases restricted in size, as formerly. This system will have a tendency to crowd out the small operator and to encourage mining on a large scale. All development was previously confined to the shallow deposits, but with larger companies

the deeper orebodies may be taken up. The Granby company is the largest land owner in the lead and zinc region of southwest Missouri. The same Company announced the building of a new concentrating plant in place of the old one which had been in service for over 25 years. The plant is to be a 250 ton mill, modern in every particular, and specially designed to treat silicate ores. The old mill was one of the best zinc-silicate concentrating plants in the district, having a complete sizing system, and old-style Hartz jigs. In this plant the capacity was limited to 25 tons per shift, and even thus there was a loss of 7% zinc silicate in the tailing from the mill. The plant did not handle the ores directly from the ground, but treated those cleaned on hand jigs and sluices. In the treatment the zinc content could be raised to 45 or 47% zinc.

Another innovation has been the introduction of a steam-shovel for use in the sheet-ground mines of the Prosperity camp. The shovel has been installed in the No. 3 shaft of the American Zinc, Lead & Smelting Co., where it has now been on trial for the past two months. During that time it has shown some good records. All of the machinery on the shovel is armor-protected, in order to save it from breakage when blasting is done in the mines. The boom is 18 ft. long, and the dipper is carried on a novel form of sliding arm. The power is supplied by three engines, one to drive the drum which raises the shovel, one to push the sliding arm by means of a chain-gear, and a third to revolve the machine and provide traction for the entire apparatus. The shovel is placed upon low wheels with broad tires, and can be moved from place to place by laying boards upon the floor of the drifts to provide a smooth surface. The minimum height of drift in which the shovel will work is 14 ft., while the drifts at the American are 15. The machine requires a full swing of at least 25 ft. These requirements limit the use of the machine, as nearly all of the sheet-ground mines have drifts below 10 ft. in height, and the soft-ground mines are either closely timbered or require pillars closer than 25 ft. The machine takes the place of six shovelers, and requires two men to operate it, an engineer and a helper to break big boulders. The machine is run with compressed air and consumes only as much air as is required for two air-drills.

GLOBE, ARIZONA.

Inspiration Mine Under Option for More than $1,000,000. — Ore Reserves of Miami Copper Co.— General Development Co. Extending Interests.—Warrior Copper Co. — Eureka Copper Group. — General Activity.

The recovery of copper mining in the Globe district has been so complete that the panic of last October has been almost forgotten. It is no exaggeration to say that Globe has made a greater advance than any other copper mining district in the West, with the possible exception of Butte, Montana. The marked improvement in the Old Dominion mine, and the increased output of copper by that company; the development by the Miami Copper Co. of an immense deposit of low-grade sulphide ore that promises to make one of the great copper mines of the United States; the opening of a very large and high-grade body of ore by the Warrior Copper Co., and the important developments on the Black Hawk fault by the Superior & Boston and the Arizona Commercial Copper companies, explain the expansion of mining here and the greater attention that Globe is attracting in the financial centres of the country.

At the present time a greater number of mining men are here examining properties, who represent large capital seeking investment, than for many months previous. Two large mining concerns are negotiating for an option on the Inspiration mine, and one of them has had experts at the property for two weeks, sampling and assaying the ore. The Inspiration is one of the large copper properties of the Globe district, the control of which is held in Kansas City and Leavenworth by people who have no knowledge of mining, and are without sufficient resources to finance so large an enterprise. Yet they are holding for a stiff price, namely, $1,500,000. J. D. Coplen, the general manager of the property, owns a large minority interest. The Inspiration is considered by many to be worth the price asked. In all probability it will soon pass to a stronger ownership. The property adjoins the Miami Copper Co.'s holdings, upon which there has been developed one of the most extensive sulphide deposits in the country. The Inspiration is opened to the depth of 350 ft. and, it is claimed, has developed 1,500,000 tons of chalcocite ore averaging about 3% copper, and an equal amount of oxidized ore yielding 3 to 4%. The sulphide is found on a contact between Pinal schist and Schulze granite, and is disseminated through the schist in small particles and seams varying in thickness from a knife-blade to six inches.

The Miami Copper Co. was floated last spring by the General Development Co., which had developed 2,000,000 tons of 3% ore, which, according to J. Parke Channing, the consulting engineer, had been increased by the middle of July to 4,400,000 tons and 2,200,000 tons partly opened up. Since that date the amount of ore reserve has increased to more than 7,000,000 tons. The deposit has been opened on the 270, 370, and 470-ft. levels. On the 470-ft. level the orebody has been opened 1000 ft. along the strike and over 1200 ft. across it. The 570-ft. level is now being opened, and the cross-cut and drifts are in the same character of ore but lower grade than that developed on the levels above. The Miami company is waiting on the extension of the railroad from Globe to its property to begin the construction of the first 1000-ton unit of a concentrator, and because of the enormous tonnage of ore developed, the management has decided to erect the second unit immediately following the completion of the first unit. The General Development Co. has taken over the Newman option on the Keystone group, adjacent to the Miami mine, and has started development work. Churn-drills will be used to prospect the ground to the depth of 600 ft. The Keystone has produced about $300,000 from a vein of silicate ore near the surface. The sulphide deposit has been developed in the Inspiration up to the Keystone side-line at a depth of 350 feet.

The Warrior Copper Co., of whose property little has been heard for some time, is now attracting considerable attention. Under a former management the company, then the Black Warrior Copper Co., expended upward of $1,000,000 on the property, most of it in the construction of a plant and other improvements on the surface, including a leaching plant, sulphuric acid plant, and smelter. The surface ores were found unadapted to the leaching process, and the enterprise was a failure. For the past four years E. M. White has been in charge of the property, and he has developed a large high-grade orebody on the 250-ft. level of the Montgomery mine. The west cross-cut is in ore for 20 ft. averaging 22% copper, with neither wall in sight; the east cross-cut has gone through 40 ft. of ore that runs about 16% copper. A winze is in good ore 75 ft. below the level. For three and a half years Mr. White has shipped ore continuously from the Montgomery mine, the returns from which have helped pay for a good part of the development. The Warrior is now shipping 55 tons of ore per day, most of which is taken from the drifts and cross-cuts in the course of development. The Warrior company's original group of claims adjoins the Miami property on the south. The Warrior holdings are the largest in the Globe district, numbering 70 claims.

The Eureka copper group of eight claims, surrounded by the holdings of the Miami, Inspiration, and Keystone companies, and the Berray & Hunt claims comprise one of the best situated and most promising properties in that part of the district. A large amount of silicious ore taken from surface workings on the Eureka returned $250,000 gross. A strong vein of 8% ore has been opened to a depth of 150 ft. It is probable that a company will be incorporated to develop the Eureka property. The group of claims owned by the Live Oak Copper Co. adjoins the Keystone on the south. The surface showing on the Live Oak is among the best in that favored locality, and between $600,000 and $700,000 of ore has been mined in surface workings. Boone and Strang, lessees, in 1906 shipped ore from the Live Oak that netted

them $200,000. The property is idle at present and will probably be sold within a year. The Orphan Copper Co. is developing a group of claims that lies southeast of the Keystone. A prospect shaft 150 ft. deep has been equipped with a steam-hoist and air-compressor, and will be sunk to a depth of 500 ft. before much lateral work is undertaken. Some good ore has been taken from shallow workings, and high-grade sulphide was recently found in the shaft.

PIOCHE, NEVADA.

Lead-Ores in Demand. — Favorable Smelter Rates on Pioche Ores.— New Plant at Nevada-Utah. — Day Mine to Begin Production. — Mendha Nevada Mining Co.'s Developments — General Activity. —Important Discoveries.

Although less ore is going out from here now than was shipped last spring, the camp has made substantial advance. Considerable machinery has been installed and several mines not then sufficiently opened are nearly ready to begin shipping. The smelting situation affecting the kind of ores which this camp produces has wonderfully improved. Practically all the mines in the district carry lead, and lead ores are decidedly in demand at the Salt Lake smelters. With the exception of the Boston & Pioche, on the old Yuba dike, every mine now being worked in the region is at present in the limestone. It is a peculiarity of mines in the limestone in this region to carry an excess of manganese and iron. As the smelters pay 10 c. per unit for an excess of either mineral, or both combined, and 5c. for limestone in excess, and as lead ore is in active demand, the ores from Pioche get a light treatment-charge.

The U. S. Smelting, Refining & Mining Co. has lately been actively in the market for lead ores. The new Tintic smelter, which blew in recently, is not only seeking ores here, but is now treating a considerable tonnage of ores which formerly went to the United States Co. or to the American Smelting & Refining Co., and thus making it imperative for them to seek fresh supplies elsewhere. The Steptoe smelter, at Smelter, is already making from 15 to 20 tons daily of blister copper from the product of one and a half units of the concentrating plant. It is the intention to have all four units in commission within a year, when the copper output will be nearly trebled. It is generally understood that the Steptoe smelter will add lead furnaces to its plant, and enter the market for all classes of custom ore. As a part of this plan, a reliable authority states that arrangements have been perfected for extending the railroad from Goldfield to Ely, and that negotiations are in progress for building from Ely to Pioche. Those two extensions when completed will open up the mines of the entire State to the Steptoe smelter, with much shorter hauls than to the Salt Lake smelters. When Samuel Newhouse was here in May last he was so impressed with the ore resources of this district that he announced his intention to erect a smelter at Bullionville, 12 miles east, where the old mills left 170,000 tons of tailing, in which Mr. Newhouse is interested. The San Pedro, Los Angeles & Salt Lake R. R. Co. has long desired to establish a smelting plant at Las Vegas, on its line. During the past summer it had experts in the field for months, examining the mines of the Pioche district and all the rest of the region from which a smelter at Las Vegas would naturally draw ores. The report of these experts has not been made public. The Nevada Utah completed its 300-hp. steam plant at the Day mine more than a month ago, and has been sinking vigorously on the Onondago shaft ever since. The old Onondago shaft, 500 ft. deep, has been enlarged, straightened, and timbered, and already sunk nearly 100 ft. deeper. In about two weeks more sinking will be completed, and driving begun toward the old ninth level, which L. Webster Wickes expects to tap about December 1. That will re-open the mine for shipping, which was discontinued about three months ago. The old working shaft near the mouth of the Day cross-cut at the third level, and its antiquated plant, have been permanently abandoned. With the two shafts thus connected by the ninth level, the mine will at once be perfectly ventilated, a condition heretofore seriously lacking. James P. Gaskill, chief engineer of the Nevada-Utah, and Mr. Wickes are confident that with their new plant and a carefully matured system of development and operation already planned, they will be able to put ore into the bins at the Jack Rabbit end of their narrow-gauge railroad for 50c. per ton, and for 25c. per ton more deliver it into cars at the Pioche depot for shipment to the smelters, hauling it 15 miles over the narrow-gauge railroad. Mr. Gaskill says it is his purpose to give his attention and energies exclusively to one at a time of the various holdings of the Nevada-Utah. By Christmas the Day should be again producing and, with the new economies, yielding a handsome net revenue, the amount of which will depend upon prevailing prices for silver and lead. The Company owns what is left of the famous old mines, Raymond & Ely and Meadow Valley, at Pioche, practically virgin below the 1200-ft. level, at which point the water-level was found.

The Boston & Pioche, which owns a group adjoining the old Yuba mine of the Nevada-Utah on the north, installed its new 100-hp. gasoline plant several weeks ago, and has been shipping regularly two or three cars per month of high-grade Yuba East ore. The Prince Consolidated has its new 100-hp. plant in operation. The main shaft is being sunk in shale below the fourth level, while driving is still being done in limestone in the upper levels. The management is negotiating with the smelters for a contract, and when this is made, arrangements must be made for shipping. The Mendha Nevada Mining Co. has its new 40-hp. gasoline plant installed and is shipping about 50 tons of ore per week, assaying 25 to 30% lead, 25 to 30 oz. silver, and $15 gold per ton. All the ore has come from development work, practically no stoping having been done in the mine in recent years. The Mendha is one of the old mines of the camp, in what is known as the Highland district, about eight miles from Pioche. The ore occurs in bedded veins in limestone at different horizons, these veins being connected by fissures which show a system of block-faulting most interesting to the geologist. The mine was a large producer in the past and gives decided promise for the future. The Ely Valley Mining & Milling Co., about three miles west of Pioche, has sunk a shaft on a strong fissure in limestone. At about 130 ft. a drift was run both north and south. Fifty feet to the north of the shaft a cross-fissure was found, estimated by Edward Thomarson, the manager, to be 25 ft. wide. It is a lead carbonate, and Mr. Thomarson says that careful sampling indicates about 40% lead, 16 oz. silver, and $2 gold per ton. The drift south from the shaft at a distance of 20 ft. cut a 2-ft. seam of galena, low in silver, which was explored 20 ft. Mr. Thomarson intends to sink the main shaft to the 300-ft. level and drive north to the cross-vein. The Ely Valley recently installed a 25-hp. gasoline plant.

About three and a half miles to the southwest, on the Pioche Demijohn, a vertical shaft is being sunk in limestone. At 100 ft. a cross-cut entered a vein 40 ft. wide. It is a lead carbonate, carrying streaks of silver chloride and bromide which in places assay over 1000 oz. per ton. The entire body, 40 ft. wide, will apparently pay to ship. It will yield, besides the lead and silver, an average of $8 per ton in gold. The main shaft is now down about 175 ft. This property is equipped with a horse whim, but Owen A. Bailey, of Salt Lake City, the manager, expects to install a gasoline hoist soon after the mine is opened on the 200-ft. level.

The Bristol Consolidated has opened up several new bodies of ore the past summer and has been shipping from one to two cars per week. Several lessees working on this property have also shipped a car occasionally. The Nevada-Des Moines, on the flat in the north part of the town of Pioche, which created so much excitement a few months ago by reported finds of high-grade gold ore in cores from a diamond drill, finally got a 40-hp. gasoline plant installed, and has sunk the shaft from the 225-ft. point to the 310, going down four to five feet per day. The highest assay so far has been 95 oz. silver and 40c. gold per ton. The Company is confident of striking a bonanza within the next 100 feet.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Blast-furnace slags, as a rule, run a little higher in copper than reverberatory slags produced from the same ore.

Pure silica, or quartz, free from iron, is in some demand for porcelain manufacture. The only permissible impurities are alumina, lime, potash, and soda.

A strong cement for repairing mineral specimens and the like may be made by the following formula: 2 oz. gum arabic, 1½ oz. starch, and ½ oz. white sugar. Reduce the gum arabic to powder and dissolve it in water; dissolve the starch and sugar in the gum solution and cook the mixture in a double boiler until clear. A little gum camphor or oil of cloves will prevent the cement from spoiling.

The stadia is designed to secure rapidity rather than accuracy; but nevertheless, with reasonable care a considerable degree of accuracy may be obtained. The degree of precision is dependent upon the magnifying power of the telescope, the length of sight, and the ratio of the space on the rod corresponding to a given distance on the ground. Using an engineer's transit with ordinary care, horizontal distances should be determined within an error of not more than 1 in 800 or 900.

Size of wire is ordinarily expressed by an arbitrary series of numbers. Unfortunately, there are several systems, so that it is always necessary to specify the method or wire-gauge used. Wire for electrical purposes is always referred to the so-called Brown & Sharpe gauge, the diameters of the wire being obtained from a geometric series, in which No. 0000 is 0.4600 in. diam., and No. 36 is 0.005 in. The Roebling gauge is almost universally used in this country for iron and steel wire.

Magnesia is regarded as dangerous in cement when in excess of 4%. Many German engineers, however, insist upon raising the limit to 8%. Contractors, generally, are unwilling as yet to accept such material. Magnesian cement will not stand as high a temperature in burning the 'mix' as non-magnesian cement; in other words, it suffers more from 'overburning.' Magnesian cements possess a higher coefficient of expansion than normal cements, and show a lower tensile strength. California possesses immense quantities of magnesian limestone which could be utilized in cement manufacture if standard specifications would admit of the use of a product containing from 4 to 6% magnesia.

Organic matter in tailing acts as a cyanicide in so far as the decomposition of the vegetable debris results in the formation of carbon dioxide and various organic acids. The latter may be neutralized with lime. If the organic matter is present in large quantity, as leaves, roots, and the like, it will be necessary to remove it by screening. The question involved is mainly one of expense, and a few intelligent tests under competent direction will be necessary to determine the commercial feasibility of treating a tailing-pile containing vegetable refuse.

Galena is a very stable mineral, resisting alteration from atmospheric influences more effectually than most sulphides. It oxidizes slowly to anglesite (lead sulphate), which is very soluble. This reacts with carbonic acid, precipitating the relatively insoluble carbonate, cerussite. The actual precipitant is perhaps lime carbonate in solution. To a small extent galena may alter to the oxides litharge and minium, but these compounds are rarely found in nature. Alteration of galena proceeds much more rapidly in a semi-arid country than in a region where precipitation is abundant and constant.

Silver in galena is usually not transported very far upon the alteration of the lead mineral. It will at first form a sulphate, which is soluble in water (1.15 parts silver sulphate dissolves in 100 parts water at 60°F.), but as all waters near the surface contain small quantities of sodium chloride, the silver will be precipitated as chloride (cerargyrite or horn-silver), which is almost absolutely insoluble in water, even with carbonic acid in solution. It is doubtful if any material quantity of silver leaches away to lower depths with the progressive alteration and denudation of a vein. The tendency of silver is distinctly to accumulate near the outcrop, forming surface enrichments. Silver being an exceedingly active element chemically, the possible reactions are multitudinous and complicated, but the alteration to chloride, and the reduction to native silver, are the end-products accounting for the larger part of the metal which had been contained in the original ore.

Refraction may be determined directly in the field by a method first used by Comstock, which is as follows: The eye-piece and object-glass of a transit are focussed so that the image of the sun and of the cross-hairs can be seen on a piece of white paper, or better still, on a cardboard, held by the hand. Set the horizontal circle of the transit to read some integral ten minutes, and point on the sun with the lower motion. Note the watch-time when the sun's disc is tangent to the vertical wire. Keeping the lower motion clamped, turn the alidade in the direction of the sun's motion (to the west), and set the vernier to read the next integral ten minutes. Note the time when the sun's disc is again tangent to the vertical hair. Read also the vertical angle to the centre of the sun. Then calling n the interval of time in seconds elapsed while the sun (really the earth) was passing through ten minutes of arc, and h the altitude of the sun in degrees, the refraction d, in minutes, is given by the equation:

$$d = \frac{2000}{h \times n}$$

The maximum errors in using this formula should not be more than 15 seconds when the sun is higher than 10 degrees.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Mining Claims on Forest Reserves.

The Editor:

Sir—Your editorial in the MINING AND SCIENTIFIC PRESS of August 8 is noted with pleasure. There are several matters mentioned, however, which might give a wrong impression, especially as to the proper functions of forest officers, both in the past and at present. As to mill-sites, briefly, they are necessary adjuncts to proper mining, and this has always been the attitude of the Forest Service. The regulation in the Use Book for 1908 merely places upon record the uniform policy of the past. I believe that the point should be emphasized that claimants are not obliged to look to the Forest Service for their patents. These matters are entirely within the jurisdiction of the Department of the Interior, to be determined according to the laws of Congress. True, as stated by Supervisor Barrett, forest officers make examinations of claims within the forest, but these examinations are merely to gather evidence to present to the General Land Office. Where the claims are apparently valid, there is no need for more than a superficial examination. Your statement, "The chief danger, however, is not from legitimate mining, but from fraudulent application of the mining law to attain other purposes," shows the reason for the examination. Where the claims are apparently located for fraudulent purposes, they are examined carefully, so that the public may be protected and the actual conditions shown when the matter comes to a hearing, but forest officers can do no more than present the facts in each case. They cannot determine the validity of a claim, nor can the Forest Service. The claimant can present contrary evidence, if such evidence exists, and the matter is disposed of by a judicial proceeding in which the Forest Service has no authority whatever. It is not, therefore, accurate to say that it lies within the scope of the supervision exercised by forest officers to determine its mineral character or to pass judgment upon the validity of a claim. He can do neither. He can collect evidence upon these points, but the law itself is wholly beyond his influence and is the same within and without the National Forests.

I fear that it would be difficult to frame legislation which would define the presence of a valid discovery more adequately than the existing law. Discovery sufficient "to justify a prudent person in the expenditure of money and labor in exploitation" (Chrismas *v.* Miller, 197 U. S., 313), is the rule, and, if properly applied, I believe adequate. The evidence gathered by forest officers, miners, and geologists, is of value in proving or disproving the existence of such discovery, but it is primarily for the claimant to establish the discovery. So far as I am aware there was no serious contention ever made that the old leasing system should be re-adopted. During the recent coal-famine it was very generally agreed that a necessary of life, such as fuel, ought not to be the subject of monopoly, and this opinion still exists, but I do not believe a return to the old system of leasing other mineral lands has ever been actively advocated since it was abandoned.

I greatly appreciate the spirit of your editorial, and am writing, not in defense of the efforts of the Forest Service to secure a compliance with what seem to me to be very reasonable laws, but to dispel, through your assistance, the general impression that there is a separate system of mining laws or regulations for the National Forests. The mining laws for the public domain and for the National Forests are uniform.

A. C. SHAW.
Acting Law Officer, U. S. Forest Service.
Washington, D. C., September 10.

Cyanidation of Silver Ores.

The Editor:

Sir—F. J. Hobson's account, in the MINING AND SCIENTIFIC PRESS of August 1 and 8, of the successful cyanide treatment of ores containing the sulphide and sulpho-salts of silver, is of great interest and value, both technically and historically; but his explanation of the reactions involved is decidedly open to question, and some of the equations put forward to support his views seem to be quite incompatible with established facts. An equation ought to express quantitatively a reaction going on between definite weights, or rather masses, of the original materials, yielding products of known composition, but in some cases at least Mr. Hobson has given us formulas representing substances whose non-existence has been pretty conclusively proved, and has accepted feeble and indirect evidence as indicating their presence. I refer particularly to mercurous sulphide and to potassium mercurous cyanide (Hg_2S and $KHgCy_2$). The former of these has been shown to split up, if formed at all, into a mixture of metallic mercury and mercuric sulphide ($Hg + HgS$). While mercuric cyanide ($HgCy_2$) and potassium mercuric cyanide ($K_2Hg''Cy_4$) are well known, and can be readily prepared and crystallized, the corresponding mercurous compounds have not been described, and find no place in chemical literature. A careful investigation which I made some years ago indicated, and the experiments described below, which have been made or repeated during the past few days, will, I think, prove that potassium mercurous cyanide cannot exist in solutions prepared in the manner and under the conditions described by Mr. Hobson.

I believe that the beneficial effects which have been observed to follow the use of mercury salts in cyanide solutions can be sufficiently explained by the well known properties of potassium mercuric cyanide when used in conjunction with free alkaline cyanide as a solvent for the precious metals, coupled with its equally well known efficiency as a precipitant of soluble sulphides. For convenience of reference in discussing them, I have taken the liberty of numbering Mr. Hobson's equations (on pages 182 to 184 of the issue of August 8) consecutively from 1

to 19: other equations which I introduce are numbered beginning with 21. His equation,

(2) $Ag_2S + 5KCy + O + H_2O = 2KAgCy_2 + KCyS + 2KOH$,

expresses the fact that thiocyanate and potassium silver cyanide result from the action of potassium cyanide on silver sulphide in presence of air. This reaction appears to take place to some extent, but it is certain that another reaction also takes place, for even in the absence of oxygen silver sulphide is dissolved by cyanides, presumably thus:

(21) $Ag_2S + 4KCy = 2KAgCy_2 + K_2S$.[1]

This reaction is reversible. If we dissolve a fairly large amount of Ag_2S in a strong solution of KCy, and dilute it shortly afterward, more or less of the Ag_2S will be re-precipitated, proving that some of the sulphide radical remained in the solution. Or upon adding a little K_2S we will also get some silver thrown down as Ag_2S, which will re-dissolve upon adding more KCy, and so on. This fact was noted 50 years ago by Bechamp, and is recorded in Fresenius' 'Quantitative Analysis' under Silver. The reaction has been more recently studied by Berthelot, who found that in dilute (N/10) solutions nearly 100 molecules of KCy were required to balance one molecule of K_2S, in order to retain silver in solution, instead of four molecules, as equation No. 21 seems to indicate. To be exact, the equation given by Berthelot as representing the conditions of equilibrium is:

(22) $96\ KCy + Ag_2S = 2KAgCy_2 + 92KCy + K_2S$.

Now this proportion (96 mol. KCy to 1 mol. Ag_2S) means that 96×65 parts of KCy are required to dissolve and hold in solution 2×108 parts of silver in the form of sulphide, or 28.9 to 1, if none of the sulphide is oxidized. This value agrees remarkably closely with the ratio 30 to 1 which Mr. Hobson has found necessary in practical work with sands containing silver, presumably as sulphide, as he states that the chloride and bromide require much less.

If the solution containing $KAgCy_2$ and K_2S with excess of KCy is exposed to the air for some time and then diluted, as a rule no silver sulphide is observed to form, but thiocyanate (KCyS) can be detected in the solution. No doubt this is owing to slow oxidation of the K_2S by oxygen, thus:

(23) $K_2S + KCy + O + H_2O = KCyS + 2KOH$.

Equations 21 and 23 together are equivalent to equation 2 as given by Mr. Hobson, and quoted above, but it expresses the fact that the change goes on in two stages, and accounts for some of the soluble sulphides stated by him to invariably occur in the solution, as the latter step (oxidation of soluble sulphides) goes on rather slowly. I may add that large quantities of thiocyanate are found in the solutions obtained in the treatment of certain ores which carry only traces of silver but much sulphide of iron, and that other sulphur compounds, especially thiosulphates (such as CaS_2O_3) and sulphates, are also sometimes produced in working solutions, apparently by oxidation of soluble sulphides. In order to prevent the interference of the soluble sulphides with the solution of additional silver, or the re-precipitation of the silver already dissolved, they must be eliminated by oxidation or by precipitation with some suitable metallic compound.

As stated by Mr. Hobson (equation 3), the presence of zinc prevents any large accumulation of sulphide in solution; the reaction is, however, also reversible and incomplete, so that small amounts of sulphide cannot be removed in this way. Silver compounds are more effective, acting by virtue of the reversal of equation 21, which accounts for the re-precipitation of silver which is occasionally observed. It is obviously impossible to utilize them in practice. Lead compounds remove nearly all the sulphide, a soluble alkaline plumbite being usually first formed, in presence of an excess of alkali, which reacts with the sulphide:

(24) $PbAc_2 + 4KOH = K_2PbO_2 + 2KAc + 2H_2O$.

(25) $K_2PbO_2 + K_2S + 2H_2O = PbS + 4KOH$.

The most effective precipitants, however, of sulphides from cyanide solutions are soluble compounds of mercury, which form the double cyanide K_2HgCy_4 and then react as follows:

(26) $K_2HgCy_4 + K_2S = HgS + 4KCy$.

This reaction goes on to completeness, and there is no appreciable tendency for the precipitated HgS to re-dissolve. It only dissolves, if at all, in presence of oxygen or oxidizing agents, and without the reformation of sulphide. In equations 7, 8, and 9 certain reactions have been ingeniously worked out to explain the solubility of stephanite and ruby silver ores. These are probably incorrect in so far as they assume the existence of the mercurous salts above referred to, but the formation of soluble sulpharsenites of calcium and the like (or of potassium or sodium) probably goes on to some extent. These sulpho-salts, however, when brought in contact with double alkali cyanides of silver or mercury, behave precisely like simple alkaline sulphides: for instance, $Ca_3(AsS_3)_2$ acts as if it were $3CaS + As_2S_3$ (or, in presence of sufficient CaO, as $6CaS + As_2O_3$), precipitating mercury as HgS and silver as Ag_2S, unless a sufficient excess of KCy is present, until all the S is finally removed.[2]

Mercuric cyanide is a salt which in solution fails to give many of the reactions usual with mercuric compounds. This peculiar behavior is explained by its being practically undissociated. It is, however, decomposed by soluble sulphides, and by certain metals, such as zinc or copper. It is well known that mercuric oxide, or mercuric chloride, in the presence of an alkali, when added in excess, will decompose more or less rapidly all other simple or double cyanides, all the cyanogen being finally converted into $HgCy_2$; this being the basis of various methods of estimating total cyanogen in solutions. I have found by repeated experiments that when mercuric chloride is added to a mixture of KCy and K_4FeCy_6, in a solution of alkaline reaction, the ferrocyanide is

[1] The K_2S is probably hydrolized in water, forming KHS + KOH, but for the present purpose it is simpler to consider the K_2S as remaining in solution unchanged.

[2] Bertram Hunt has explained this more fully in your issue of August 29, which has reached me since the above was written. He does not, however, take into account the effect of mass-action, whereby a certain amount of silver is dissolved, even in the presence of sulphides in solution, provided that the cyanide is present in sufficient excess.

unaffected until enough mercury has been introduced to convert all the cyanogen of the simple KCy into $HgCy_2$. That is to say, 130 parts of KCy protect the ferrocyanide until 200 parts of mercuric mercury have been added, according to the equation:

(27) $2KCy + Hg''R_2 = Hg''Cy_2 + 2KR$,

where R stands for an equivalent of chlorine, oxygen, nitric acid, or other radical in some mercuric salt. When a mercuric salt is added in excess of this amount the ferrocyanide is gradually decomposed with the formation of some ferricyanide (sometimes prussian blue), and with large excess it is finally and completely decomposed, all the cyanogen going to $HgCy_2$.

When mercurous salts are mixed with an excess of solution of KCy the reaction taking place is, as admitted by Mr. Hobson in the case of the chloride, of this character:

(28) $2Hg'Cl + 4KCy = K_2Hg''Cy_4 + 2KCl + Hg$,[3]

exactly half of the mercury being separated as metal. But he claims that, in the presence of a sufficiency of a ferrocyanide some other reaction takes place, with the formation of a double mercurous cyanide, hitherto unknown, no mercury separating, and states that some reducing agent such as the ferrocyanide is necessary to produce this effect. To test this assertion I took the following amounts of material, adding the powdered HgCl to the solutions of the other salts:

(a) 0.192 gm. KCy
0.25 gm. HgCl (containing 0.212 gm. Hg)
50 c.c. water.

(b) 0.192 gm. KCy
0.216 gm. K_4FeCy_6 crystals
0.25 gm. HgCl
50 c.c. water.

(c) Same as (b).

In both (a) and (b) almost exactly half of the mercury was found in the solution, and half in the form of precipitated metal, as demanded by equation (28). After standing 15 minutes the ferrocyanide remaining in solution (c) was found by titration exactly the same as that originally taken, only a minute trace of ferricyanide being detected. Further, to test absolutely whether the mercury in the solutions containing ferrocyanides could be in the mercurous state, the following solutions were prepared:

(d) To 50 c.c. water 0.5 gm. HgCl was added and well stirred; 100 c.c. of 1% KCy solution was then added.

(e) In 50 c.c. water 2 gm. K_4FeCy_6 crystals was dissolved; 0.5 gm. HgCl was added, and well stirred; 100 c.c. of 1% KCy solution was added as before. After stirring 5 minutes, approximately equal quantities of metallic mercury separated in each instance, and were filtered off after standing 15 minutes. Equal portions of the clear solutions were taken in two beakers, platinum electrodes were placed in each, connected in series, and both were electrolyzed. The amounts of mercury deposited on the two cathodes were exactly the same, proving that the mercury in each solution was in the same state of oxidation; whereas, if the first (d) contained mercuric, and the second (e) mercurous mercury, as Mr. Hobson contends, the mercury deposited in the latter case ought to have weighed double as much as in the former. These experiments, which can be easily verified in any laboratory, seem to effectually disprove any claim of the existence of a double mercurous cyanide in such solutions.

Of course, the use of double potassium mercuric cyanide as a solvent or accessory to the solution of gold has been known for many years, having been mentioned by Skey in a New Zealand publication about 1876, and by C. H. Aaron and others in the MINING AND SCIENTIFIC PRESS in 1891; it has also been the subject of patents by Hood and Keith in this and other countries. As pointed out by Skey, when dissolving metallic gold, the action of KCy is accelerated at first by the addition of mercuric salts, but retarded later owing to the protective effect of the film of mercury or amalgam produced.

The following is a summary of some results obtained in the investigation before referred to, and may be of interest in this connection. In these tests pure crystallized salts were taken, dissolved in distilled water, and tested with gold and silver foil, with the results stated.

Pure $Hg''Cy_2$ solution:

No oppreciable effect on gold or silver.[4]

Basic Hg'' cyanide, $HgO.HgCy_2$:

No appreciable effect.

Pure $K_2Hg''Cy_4$:

Very slight action on gold[5] if dilute and cold; slight solution of gold if stronger; more rapid if heated. Mercury is precipitated as gold dissolves. With silver the action is similar but more rapid.

$K_2Hg''Cy_4$, with little KCy:

Action much more rapid, both on gold and silver, than with either salt separately. One atom of metallic mercury is precipitated for two atoms of metal dissolved, whether gold, silver, or copper.

$K_2Hg''Cy_4$, plus equal weight of KCy:

Action very rapid, but more gold and silver are dissolved in proportion to the mercury deposited than with less free KCy. Action becomes slower when a considerable coating of Hg has accumulated. Platinum is also attacked.

$Hg''Cy_2$ with either KOH, NaOH, NH_4OH, or Na_2CO_3:

[3] Bertram Hunt (MINING AND SCIENTIFIC PRESS, August 29) points out that, with an excess of HgCl, all the cyanogen combines to form $HgCy_2$. The second reaction he suggests is probably erroneous in showing no metallic mercury deposited, and requiring the presence of oxygen. The following:

(29) $2Hg'Cl + 2KCy = Hg''Cy_2 + 2KCl + Hg$

seems more probable, as metallic mercury is invariably reduced. Even crystallized $K_2Hg''Cy_4$ when dissolved and mixed with HgCl yields metallic mercury:

(30) $2Hg'Cl + K_2Hg''Cy_4 = 2Hg''Cy_2 + 2KCl + Hg$.

I have not had an opportunity to test the last two equations quantitatively, but they appear to agree with observed facts.

[4] Prof. C. McPhail Smith finds that a small amount of silver is dissolved by $HgCy_2$ and displaces metallic Hg, when spongy silver is used in a hot solution.

[5] Generally, metal in a spongy condition, such as cornet gold or cement silver, or rolled strips previously deeply etched, was more rapidly attacked than smooth rolled gold or silver, even when the surface of the latter was most carefully cleaned.

Gold and silver dissolved, with deposition of metallic mercury.

$Hg'Cl$ (mercurous chloride), plus K_4FeCy_6, plus excess of KCy:

Solution (after filtering off the metallic mercury which separates) dissolves gold or silver with deposition of metallic mercury.

When either metallic gold or silver is dissolved by any of the above mercuriferous solutions, the effect is probably partly due to replacement of one atom of Hg in the K_2HgCy_4 by two atoms of Au or Ag, which is independent of the presence of oxygen, and partly (if air is accessible) to the action of the free KCy, which is accelerated at first by the influence of the mercury-gold couple thus formed. When Ag_2S is similarly dissolved, this is an exchange of one atom of Hg for two atoms of Ag, the HgS formed being insoluble, and therefore without influence in retarding the dissolving of further portions of silver. There is an obvious economy in mercury lost, when all possible extraction is effected, by the aid of simple cyanide with air-oxidation, before resorting to the use of mercuric salts.

W. J. SHARWOOD.

Lead, South Dakota, September 3.

Creosoting of Timber.

The Editor:

Sir—I note your editorial on creosoting of timber in the MINING AND SCIENTIFIC PRESS of September 5. The practice on the Pacific Coast appears to be entirely different to that on the Atlantic. At Norfolk, Va., the timbers are subjected to live steam, then to a vacuum, the dead-oil of tar is allowed to flow in, and is then put under a pressure of 100 to 250 lb., varying with the specification. The Dominion Government and the British Admiralty both had the same specification, and I made the analyses of the timber and of the creosote used for each of them. I should infer from your editorial that the creosote used on the Pacific Coast is fired below 600°. Surely this cannot be so, as the naphthalene and naphthalene oils, which are generally considered to be the most important constituents of the dead-oil from a preservative point of view, distil over far below that temperature—in fact, in the presence of moisture, napthalene will come over in considerable quantity below 212 degrees.

F. H. MASON.

Paso Robles, California, September 11.

'Expert' or Specialist?

The Editor:

Sir—I note that writers in the MINING AND SCIENTIFIC PRESS frequently use the term 'cyanide expert.' Would not cyanide specialist, cyanide engineer, or cyanide metallurgist be better? Cyanide chemist would hardly apply, for, considering the relative progress of the chemistry and mechanics of the process, cyanide mechanic would be more apt. I have been cyaniding eleven years, and call myself a specialist, but I hope some day to be 'expert.' Ojala!

PERITO.

Guanajuato, Mexico, August 28.

Diffusion as a Factor in Ore Deposition.

The Editor:

Sir—It is evident from Lewis T. Wright's communication in your issue of August 22 that I have failed to make my meaning plain in respect of a possible cumulative effect of Soret's principle. In order to make the issue quite clear I will re-state the case, assuming certain ideal conditions, and neglecting those which have not a direct bearing on the question of the efficacy of the laws of osmosis in producing a considerable concentration from a magmatic solution. Let us assume the following conditions:

(1) A fluid magma in contact with cold walls; the magma composed essentially of the elements Fe, Mg, Si, and O.

(2) Sufficient time for free diffusion.

(3) The operation of Soret's principle as stated quantitatively by Mr. Wright.

(4) The crystallization of the minerals in the order of their basicity.

Under these conditions, what will be the sequence of the phenomena resulting in a solidified rock? Assuming further that the iron-content of the magma amounts to 20%, I imagine the solidification to proceed along the following lines: At the cooled periphery Soret's principle effects a slight concentration of the bases, and especially of the iron, and when at the contact the temperature shall have fallen sufficiently, Fe_3O_4 will crystallize out, leaving the other elements in solution. In immediate juxtaposition with the now solid magnetite the solution will be depressed below the average content in iron, containing say 10% Fe. Diffusion, however, acting alone, would immediately restore the average content in iron, while Soret's principle would again raise the percentage of iron immediately contiguous to the magnetite to say 30% Fe. On further loss of heat at the periphery there would be a further deposition of magnetite, and the same cycle of changes would occur, consisting in the deposition of magnetite through loss of heat with restoration of the equilibrium of the solution by the operation of ordinary diffusion and the operation of Soret's principle. On the complete solidification of the eruptive we should then expect to find deposited in succession from the periphery toward the centre the minerals magnetite (Fe_3O_4), hypersthene ($(Mg, Fe)SiO_3$), enstatite ($MgSiO_3$), and quartz (SiO_2). That such an ideal succession of minerals should occur in nature cannot be expected, since nature does not operate with ideal simplicity or continuity, and indeed an ore deposit is but a combination of fortuitous circumstances, or, as it has been well expressed, it is "the accident of an accident," and the departure from a regular distribution from the periphery of the Sudbury ore deposits, as cited by Mr. Wright, is readily accounted for by convection currents, varying velocity of flow, and other factors, some of which may be conceived, while others, from the nature of the case, must always remain obscure.

H. H. KNOX.

New York, September 9.

QUARTZ MINES IN COLOMBIA, SOUTH AMERICA.

Written for the MINING AND SCIENTIFIC PRESS
By F. F. SHARPLESS.

It is evident that Colombian placer deposits continue to attract more and more Americans every year, while interest in vein mining is apparently not receiving the attention which conditions in that country warrant. There are obvious and natural reasons why this has been the case, but there are no obvious reasons why it should continue to be so. For years Colombia has maintained a small but constant output of gold, chiefly from its alluvial territory. Realizing this, it is only natural that foreigners should have investigated deposits of this nature, rather than those which have been less productive.

The reports of engineers have not been uniformly optimistic. They have found, in many cases, a gold content of considerable importance, a quantity that in many localities would be attractive; but they have found also that operating costs would be far in excess of those in countries more favorably situated. Yet there have been enough favorable reports from competent authorities to assure us that there are many districts in Colombia where, with a reasonable amount of money, and intelligent management, satisfactory returns may be expected. Hence it is quite reasonable that public attention should be drawn in this direction.

A much smaller proportion of the exported gold has been derived from vein-mining than from placers, yet a small amount of native and foreign capital has been invested in legitimate operations for many years, and on the whole has given quite satisfactory results. The bonanzas opened have, in most cases, been exploited by natives; they have not been advertised in foreign countries, and have attracted little or no outside interest; so it is natural that veins now receive but scant attention. Colombia as a whole is not well explored; there are vast areas which are practically unknown, where the lack of transportation and population render exploration difficult and tedious. A comparatively small area is well peopled, and where the population is fairly numerous, moderately good trails exist, and there is no difficulty in prospecting when one grows accustomed to the native food. Such districts, however, are already quite thoroughly prospected, and it will be found that the natives are working the veins after their primitive fashion, or at least that they know of their existence.

The State of Antioquia, because of its geographical position and rather numerous population, has been more thoroughly prospected and developed than any other. Within its confines are several well-built mills where modern methods are in vogue, but by far the greater number of properties are worked with native Colombian mills and with Colombian methods. The Colombian mill is the offspring of the old Cornish stamp-mill. It is always built near the water, where power can be furnished by an overshot water-wheel keyed directly to the cam-shaft. The stamps, generally four to a battery, consist of a wooden stem about 5 by 6-in. section, bound with iron at the bottom, and furnished with a square iron shoe. The dies are of cast-iron, or oftener consist of the hardest available rock, well set in the mortar, which is built up of plank. The screen is of loosely fitting wooden slats, or a board with numerous nail-holes. The stamps are raised by wooden pegs driven into the cam-shaft, and drop ten to fifteen times per minute. The capacity of a battery is from 1 to 2½ tons per 24 hr., crushing so that the greater part will pass a 20-mesh screen. The crushed material passes over blankets or burlap, which collects the gold and sulphides. The concentrate is washed in bateas to recover the free gold, and the heavy tailing from this washing is generally ground in small arastras, and the fine material again treated in the batea. At this work the natives are expert, and it is a pretty sight to see the gold creep up the side of the batea in a clean wide band, free from the heavy sulphides, which are thrown away as valueless.

Many veins are being worked by this simple method, which would yield little or no profit to a foreigner with an expensive mill. With two or three miners, a couple of boys to carry the ore, and two women to operate the mill, each taking for his or her wage a small portion of the daily clean-up, and with a mill costing only $150, it is not possible to lose much on the investment, and the little that comes to the owner is nearly all clear profit. Larger properties are equipped with more stamps, some having as many as eight or ten batteries, arranged tandem down the hillside, so that the same water, used over and over again, serves several mills. It is in these larger properties, some of which are now worked, where new capital and modern machinery might be employed to advantage. So far as transportation goes, the placers on the lower rivers have the best of it. There are few railways in the country, and those that exist are of little assistance to the vein-miners. As regards climate and healthfulness of situation, the quartz properties have by far the best of the situation. One of the most serious disadvantages of operating in Colombia is the hot moist climate of the low-lands, where the carelessness of both native and foreign laborers is sure to result in much sickness and loss of time. At an elevation of 2000 ft. the climate is much better, while at 4000 ft. it is delightful. Owing to the scanty population, the heavy tropical growth, and moist climate of the low-lands, and the few rock-exposures, there are not many veins known below an elevation of 2000 ft. During a recent visit to Colombia I spent nearly a year in the States of Antioquia and Tolima, examining quartz veins, and nearly the entire time was spent at an altitude of more than 3000 feet.

The Marmato mines in the State of Cauca have been worked to a greater or less extent since the middle of the sixteenth century, so says Vicente Restrepo in his 'Minas de Oro y Plata de Colombia.' During my visit an English company, The Western Andes Mining Co., was working these properties, milling about 100 tons daily. At the present time the method of working is practically the same as for many generations past. The crushing device

is more modern, consisting of 40 locally-built California stamps, but the concentrators, burlap, blankets, and scratched plank are the same as used for many years. The concentrate is handled in the customary manner, that is, the free gold is removed by means of the batea, while that in the sulphides

Fire-Wood Landing, Magdalena River, Colombia.

is lost so far as the Company is concerned. As a matter of fact, the concentrate is caught by natives on the hillsides below the mine, in small stone-walled enclosures or ponds, where it is allowed to rust for some time and then re-crushed by hand, and again washed in the batea, giving up a little more gold.

Mill at Marmato, Colombia.

The Company's proportion was very small when I was on the property, being between $2 and $3 per ton milled. The quantity recovered after oxidizing is not stated, but an experiment conducted by the English company, and my own observation as well, suggest that as the workings are now entirely below the oxidized zones the ore should be smelted. Some portions can be smelted direct, others would require concentration. Fluxes are at hand, and good coking coal is within a short distance. Either copper or lead can be used as a collector; though not abundant, both are found in the immediate neighborhood in small quantities. Zinc sulphide is available in plenty, being of that variety known as marmatite, a

Marmato, Colombia.

black heavy combination of iron and zinc sulphide in various proportions. Aside from the fact that the locality is a long distance from rail or water transportation, there is no reason why smelting could not now be conducted profitably at Marmato, and with a railway up the Cauca, as there will some

Marmato Mines.

day be, the business will be conducted at a handsome profit.

The Zancudo mine at Titiribi has been smelting its ore for over fifty years, and at times has paid handsome dividends, in spite of the fact that its collecting medium, lead, has always been imported from England. To offset this heavy expense, the smelting furnaces, within a mile of the mines, are only a

stone's throw from an outcrop of good coking coal. Unfortunately the owners are not taking full advantage of their opportunities, for the coke, which is made in open heaps and with a high percentage of ash, is costing about $8 per ton, when it should be low in ash, and cost not over $2.50 per ton.

My investigations did not go so far as to prove positively that there is a good field for a smelting business in Colombia outside of Marmato and Zancudo, but I found galena and copper suphides at many points, and at almost every little Colombian mill I found concentrate, discarded as valueless, that would be worth smelting could it be delivered to a smelter without too great expense. Several mines, producing a fair tonnage of sulphides, are shipping such product to the United States, and in spite of the heavy freight charges the operation nets a very fair return.

It would be well for those now going into the country with the object of investigating the possibilities of placer mining, to bear in mind the fact that the country is rich in promising veins, and when opportunity occurs it may not prove time lost to look at some of those of which they are sure to hear from the natives. There is undisputed evidence of Colombia having produced many millions of gold, and every probability that it will produce many more.

Repetitive loading of reinforced concrete beams has recently been the subject of investigation at the Materials Testing Laboratory of the University of Pennsylvania. The following conclusions were advanced in a paper read at the June meeting of the American Society for Testing Materials by H. C. Berry:

1. That the ultimate strength of a reinforced concrete beam is not materially affected by one million repetitions of high working stresses. 2. That the maximum deflection is not affected. 3. That hairline cracks become visible for such loads at intervals of 6 to 8 in., and grow deeper as the number of repetitions is increased, but that for one million repetitions no crack extended beyond the neutral axis. 4. That the bond between the steel and the concrete is not appreciably affected, as shown by the difficulty with which the steel was removed in breaking up the beams. 5. That the position of the neutral axis is not changed by repetitions of the load. 6. That the greater part of the set in the deformation in the plane of the steel occurs in the first few thousand applications of the load. 7. That the set in the deformation on the compressive side of the beam is also relatively large for the first few thousand repetitions, and that it increases with the stress applied and the number of repetitions.

A phenomenal series of alloys has lately been experimented with in Germany, consisting of iron with either cerium or lanthanum. These alloys emit a shower of sparks on being struck with a piece of steel. The sparks will ignite gas, or cotton wicking saturated with alcohol, and will also explode black powder and other explosives. The 'sparking' property of the alloy reaches a maximum with about 30% iron.

AGITATION BY COMPRESSED AIR.

Written for the MINING AND SCIENTIFIC PRESS
By F. C. BROWN.

Now that the method of agitation in tall tanks has been adopted by many progressive companies, the following notes on New Zealand experience will be appropriate. The tanks go under the name of the 'B. & M.' tanks (Brown & McMiken) in New Zealand and Australia, the 'Pachuca' tank in Mexico and the United States, and Brown's circulating-tank in other countries. In appearance they are cylindrical, but internally they consist of a large cylinder terminating in a cone of 60° slope. The weight of the tank and its content is transmitted by the continuation of the cylindrical shell, stiffened by horizontal angle-bars to a heavy angle resting upon a concrete foundation, as shown in Fig. 1, which represents the tank in sectional elevation. The lower end of the cone is closed by a heavy cast-iron bottom, which rests upon a concrete foundation and takes a portion of the weight of the tank. A doorway in the lower part of the shell gives access to the space around the cone, and a manhole in the latter facilitates inspection of the valves when the tank is empty. The discharge of the contents, after agitation, takes place through a pipe near the bottom, provided with a valve or cock. In the centre of the tank there is a large pipe held vertically in position and open at both ends, the lower end reaching to within about 18 in. of the bottom of the cone, and the upper end terminating about 18 in. from the top of the tank. Means are provided for admitting compressed air into the lower end of this pipe in the same manner as with an air-lift.

Tanks large enough to treat charges of 125 tons are now in successful operation, and there is no reason why even larger ones should not be used. In Fig. 1 is shown the style of tank used at the Grand Junction mine, Waihi (13 ft. diam. by 55 ft. deep), complete with its internal fittings, and standing on its foundation, which consists of a ring of concrete, with a square block of concrete in the centre to support the casting at the bottom of the tank.

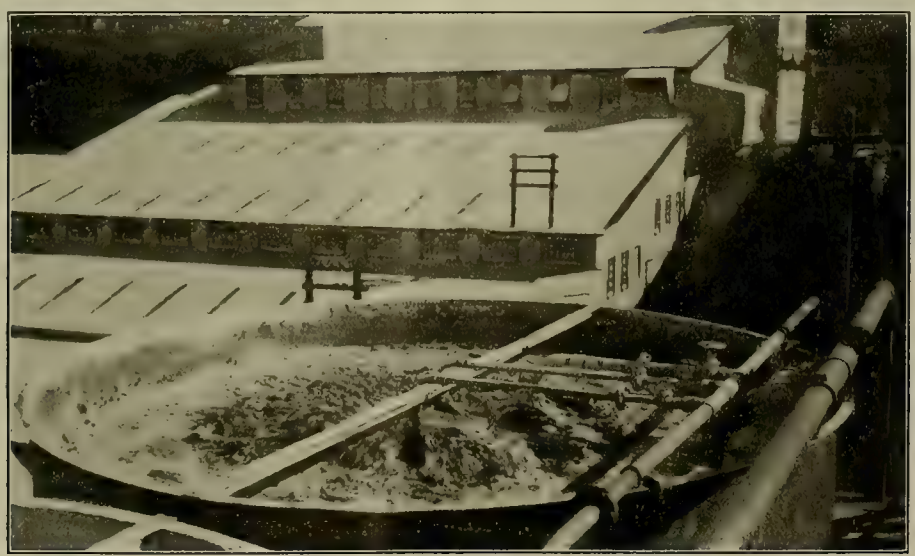
Fig. 2 shows the arrangement of jets for a very large tank, or for one in which it is required to treat concentrate or sandy material. There is an opening in the stand of the tank about 3 ft. 6 in. high by 2 ft. wide (Z, Fig. 1), and opposite this there is a manhole (M, Fig. 1). The cone is finished off with a heavy casting (J, Fig. 2) and has a discharge cock, K. B is the central pipe, C the outer air-pipe with a rubber valve, H, at its lower end, D the inner air-pipe with a rubber valve, G, at its lower end, and E, the pipe to supply the solution, water, or air to the distributor, F, which discharges through the pipes I and I', fitted with rubber valves (Fig. 1 and 2). Pipes C, D, and E are supplied with air from pipe Q, and with water or solution from pipe N, with the arrangement of valves as shown. There is a circular piece of iron plate serving as a splash-cover to the central pipe B, and this is fastened to the pipe D in such a manner that its height can be adjusted. P is the pipe to supply the slime or battery pulp. This pipe, P, branches

into two pipes, *P P*, which are carried along the two rows of tanks. The air and solution pipes are arranged in the same way. *R* is a platform which runs between two rows of tanks, and from this all the valves can be readily reached. There is a hose attached to a pipe, which goes direct to the filters.

Tall Tank Battery, Victoria Mill, Waihi, New Zealand.

This hose is used for discharging all the tanks, as they are discharged one at a time, and can be moved from one to the other.

The method of operation is very simple. The tank being filled with ground ore and solution, air is admitted through the pipe *D*, which, mixing with the pulp in the central pipe *B*, lightens the column inside and causes it to overflow, while fresh pulp is drawn in at the bottom, and is in turn brought to the top, thus producing a perfect circulation, which is kept up as long as the supply of air is admitted. Should the pulp have settled, or should it become firmly packed at the lower end of the air-lift, solution or air, or a mixture of both, is forced in through the jets *I* branching from the distributor *F*, with the result that the pulp is softened and is readily lifted through the central pipe. The initial air-pressure has to exceed that of the column in the air-lift, but when circulation has been established the pressure can be considerably reduced. The conditions for cyanide treatment are perfect, since every particle of the ore is constantly coming into contact with the solution and air as they enter the bottom of the air-lift. Sand can be treated as readily as slime, and there is no danger from interruption of the motive power, so disastrous in mechanical agitation when sandy material is being treated, as, even after weeks of standing, the contents of the tank can be readily started up, and in less than an hour the whole charge be brought into perfect circulation.



Slime in Agitation, Top of Tall Tank.

The first large tank was erected early in 1902 at the Komata Reefs Co.'s battery, at Komata, New Zealand. Its dimensions were 7 ft. 6 in. diam. by 37 ft. high, including the cone, the angle of slope of which was 55°. Before deciding to erect this, numerous experiments had been made in a small testing

tank of 20 in. diam. and 8 ft. high, and the results were highly satisfactory. Later on in the same year two larger tanks were erected, their dimensions being 10 ft. diam. by 39 ft. high. These tanks were used for treating slime, and, owing to their great depth, were found to be excellent for the final settling of slime in the decantation process, as they made it possible to decant a large percentage of the solution before finally discharging the treated material. These first tanks were not arranged with the large central pipe and jets for flushing the cone, and it was not until these important features were introduced, early in 1904, that the tall tank became an all-round practical apparatus for the agitation of battery pulp, fine concentrate, and slime. In 1903 an attempt was made to agitate finely ground sand (93% through 200-mesh) in tanks 10 by 39 ft., without the central pipe, but it was found that, although the agitation from the top of the tank appeared to be quite violent and efficient, the compressed air was working its way up through the body of the fine sand without properly agitating and mixing it. Samples of solution taken at different depths in the tank showed different values, and it was found that a large quantity of sand adhered to the sides of the cone at the bottom of the tank and was not agitated at all. The introduction of the central pipe and the arrangement of jets for sluicing the sides of the cone with compressed air or solution during agitation, made the tank a success, and it is now, without doubt, the simplest and most perfect agitator known. Seeing that ore-treatment by the cyanide process is becoming a matter of very fine grinding and agitation of the whole product as 'slime,' an agitator that does its work properly, has no wearing parts, and never goes wrong, will be appreciated by mill-men.

The evolution of the tall tank as an agitator did not come without effort. Like most good things, it required thought, experiment, and money. As already stated, it was first used at Komata, and S. D. McMiken, the battery superintendent, did good work in assisting to make it a success. Later on, when the central pipe was introduced, J. R. Noble and J. A. Thomson, of Waihi, gave valuable suggestions. Now that the tank is perfected, it seems very simple.

In treating very fine material, such as slime, a comparatively short tank will do good work, but as a general rule it is advisable to have the height about 4½ to 5 times the diameter, and height is especially necessary when it is required to treat coarse material or concentrate. It is economy to build the tanks high, as the same size of air-compressor, working at a slightly higher pressure, will supply air for a larger tonnage of ore; also because the cone, stand, and fittings remain the same, irrespective of height. It has also been found that the higher the tank compared with the diameter, the less is the the power required for agitation, and tests show that the consumption of cyanide is less in high tanks than in low ones, due to the fact that with high tanks the quantity of compressed air per ton of ore is less than with short ones, though its pressure is greater. The diameter of the central pipe should be about 1¼ in. for each foot of diameter of the tank.

The following figures relating to the air and power required are from actual working conditions extending over long periods, ranging from 6 to 18 months:

1. A tank 7 ft. 6 in. diam. by 37 ft. was used for treating slime, and required from 4 to 6 cu. ft. of free air per minute, at a pressure of 22 lb. per square inch. The charge of slime was 15 tons (dry weight), and the horsepower was from one-third to one-half.

2. The same size of tank, treating finely ground concentrate, requires 15 to 20 cu. ft. of free air per minute, at a pressure of about 26 lb. per square inch, this quantity of air gives a thorough agitation with a charge of concentrate of 35 to 40 tons (dry weight), with 1½ to 2 horsepower.

3. An installation of 10 tanks, each 10 by 39 ft., treating slime, requires 88 cu. ft. of free air per minute, at a pressure of 23 lb. per square inch. Each tank holds a charge of 35 tons (dry weight), and requires ¾ hp. per tank.

4. Two tanks, 13 by 55 ft., treating slime, require 32 cu. ft. of free air at a pressure of 33 lb. Each tank holds 110 tons dry slime. The horsepower consumed is 1¾ per tank.

When I first commenced experimenting with these tanks the probable heavy consumption of cyanide due to the action of the air used for agitation was held by some to be opposed to their success. The installation of 10 tanks, each 10 by 39 ft., at the Komata battery has been in operation for 18 months, and although there has been no opportunity for actually comparing them with the usual shallow agitator, it has been found that the consumption of cyanide is very small. At the Grand Junction mine (Waihi) are three different types of agitators, the usual shallow agitator, tall tanks, and a shallow agitator operated by a high-speed screw-propellor, and careful tests have been made, with the result that it has been proved that the consumption of sodium cyanide by slime treated in the shallow mechanically operated agitators during a period of over two months has averaged 2.6 lb. per ton. The consumption by slime treated in tall tanks (13 by 55 ft.) during the same period averaged 2.4 lb. sodium cyanide per ton. Expressed in terms of potassium cyanide these consumptions work out at 3.38 lb. per ton in the shallow agitators, and 3.12 lb. in the tall tanks. The consumption of sodium cyanide by concentrate treated during a period of two months in the agitator operated by a screw-propellor was 3.1 lb. per ton, while those treated in the tall tanks (7.6 ft. 6 in. by 37 ft.) during the same period consumed only 2.4 lb. per ton. These consumptions expressed in terms of potassium cyanide are, 4 lb. per ton in the shallow agitator and 3.1 lb. in the tall tanks. Potassium cyanide is now being substituted for sodium at the Grand Junction mine, as it is found that the former stands the action of the air better, and will effect a considerable economy.

It is not claimed for the tall tank that it increases the extraction. It is simply a perfect agitator—a statement which cannot be correctly applied to many of the shallow types of agitators at present in use.

At the Grand Junction mine, tall tanks compared with the screw-propellor shallow agitator in treating concentrate shows identical results as far as extraction is concerned, but compared with the shallow agitators with arm stirrers in treating slime they give tailing which averages 10d. lower per ton. These tanks are installed at the following properties, namely, Komata Reefs Co., which was the first to adopt them, having a battery of 10 tanks, 10 by 39 ft., treating slime; the Waihi Gold-Mining Co., 23 tanks, 6 by 15 ft., treating concentrate, and 32 tanks, 12 by 38 ft., treating slime; the Waihi Grand Junction Co., 6 tanks, 13 by

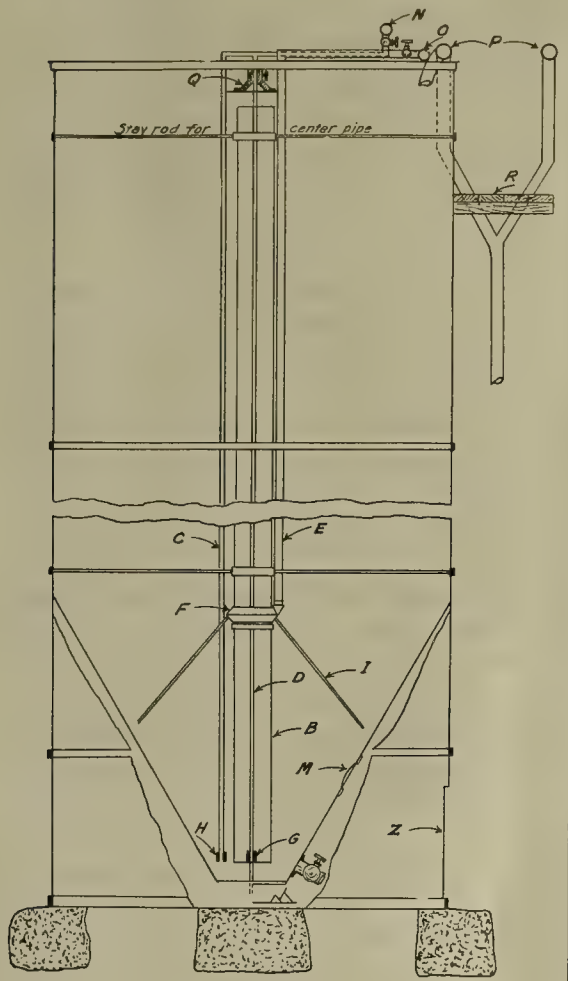


Fig. 1.

55 ft., treating slime, 6 more under construction, and 4 of 7 ft. 6 in. by 37 ft. for concentrate; and the Waihi-Paeroa Gold Extraction Co., with 9 tanks, 10 by 39 ft., treating finely ground sand.

The importance of this agitator in the Waihi and neighboring districts can be readily understood when the nature of the ore is taken into consideration. It consists of a quartz-gangue with some calcite, iron pyrite, galena, and zinc blende, throughout which the gold and silver are exceedingly finely disseminated, the former occurring chiefly as an alloy with silver in about equal proportions, and the latter as mixed sulphides of silver. The proportion of gold and silver in the ore is about one part by weight of gold to six of silver. If a high extraction is aimed at the ore has to be ground to the finest possible pulp and kept in agitation with a fairly strong cyanide solution (about 0.3%) for a period ranging from five to eight days. The concentrate, constituting 8% of the ore at the Grand Junction mine, before being re-ground will all pass a 200-mesh sieve, and the aim of the re-grinding, which is done in a tube-mill, is to bring it to such a fineness that it will pass a silk cloth corresponding to what would be a 400-mesh sieve. This degree of grinding can be brought about if collected concentrate be ground in connection with about 25% of 10-mesh sand,

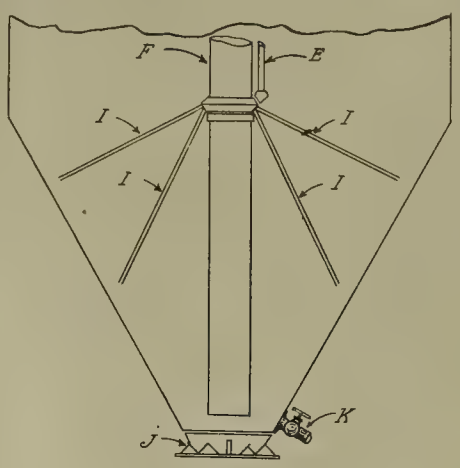


Fig. 2.

which latter is, by a special separating device, taken from the battery launder. The re-ground concentrate is then agitated in tanks 7½ by 37 ft., holding 40 tons each, for a period of 12 days in 0.4% KCy solution. The value of the concentrate will average £11 per ton before treatment, and the residue comes out at 17 shillings per ton, equivalent to an extraction of 92.3%. This is the average extraction at the Grand Junction mine for the past nine months, where 300 tons of concentrate per month, obtained from 4000 tons of ore, is treated.

'Blowing up' is one of the accidents to which deep-water divers are most liable. When a diver is crawling on the bottom with his head down, air may accumulate in the back of his suit, and, getting to his legs, cause him to 'turn turtle' and shoot helplessly upward, with the risk of coming into contact with a ship's or boat's bottom. To prevent such accidents, the diving committee of the English Admiralty has recommended that all new diving suits be provided with an arrangement for lacing up the legs and thighs.—*Compressed Air.*

An incombustible insulating substance has been recently invented by a Bavarian electrician, which, it is said, will withstand for some time the effect of an electric arc. It is made as follows: mineral pitch is dissolved in a volatile solvent (benzine), and this solution is used as a medium for making a paste of finely crushed asbestos, which is afterward compressed and slowly dried at a low temperature.

SURFACE EFFECTS OF THE CAVING SYSTEM.

Written for the MINING AND SCIENTIFIC PRESS
By LUCIEN EATON.

The theory of the 'dome of equalization' is very interesting, in view of the theoretical possibilities involved in the matter of the calculation of the size of mine timbers. Unfortunately, the application of the theory of this dome of equalization is extremely limited, for the existence of the dome depends upon the homogeneity of the rock over the opening, and the absence of special lines of weakness; and, as faulting almost invariably accompanies ore deposition, special lines of weakness are almost invariably present, so that calculations of dome-structure become guess-work. And it is easier to guess the size of the timber that will serve than the weight of the 'back' under the dome.

The capping over a caved stope, where the break has not gone through to the surface, often does not fill the entire opening, a vacant space remaining between the arch of the back and the broken rock below; but such cases are relatively rare. They are possible only when all conditions are favorable. If the stope, when finished, is approximately of the shape of the dome of equalization, very little rock will slab off, and the unsupported opening will be large. I have run across several instances of this character, some where the timber has been left standing, but not touching the walls or back of the opening, and others where the timber has rotted out and fallen away. But if the stope is wide and flat, the broken rock from the back will fill the opening before it assumes the shape of the self-supporting dome. Somewhere between these two extremes there is a mean, where the amount slabbed off will just fill the stope plus the cave above, and the back will be left in the shape of the dome of equalization. But disturbing factors are so great and so numerous that correct calculation of the amount that will break down is out of the question.

The effects of caving are as varied on the surface as they are underground. When a stope caves, and the dome above it runs up into sand or loose rock, the depression formed is usually in the shape of an inverted cone; but where the orebody is wide or deep below the surface, the subsidence usually takes the form of terraces. Sometimes comparatively large areas will break through cleanly and the whole surface will drop through suddenly and as a unit, but this is exceptional. After the back has once started to cave, the surface usually sinks in terraces, all drawing over toward the original break. The direct influence of faulting in defining the limits of the surface-subsidence is often, though not always, very clear. Large areas sometimes sink bodily, or in terraces, although only partly undermined, the limits corresponding exactly with known lines of faulting.

A description of the different results of caving at a mine where the occurrence of the ore was unusually uniform may furnish data of interest to men not familiar with the caving system. The mine in question is on the Gogebic iron range. The ore deposit consisted of a lens of soft hematite about 40 ft. in average width and 150 ft. high, with a length of nearly 1600 ft. on the incline, lying in a trough formed between a dike of diorite and a thick band of ferruginous slate, which has been a zone of extensive faulting parallel with the formation. The dike cuts across the formation, dipping southeast at an angle of 45°, but is cut off by a fault along the face of the slate. The slate dips at an angle of about 70°; N. 25°W., which is the regular dip of all the formations, except the dikes, at this point on the range. The trough in which the ore lay pitches northeast at an angle of 11°. Above the dike the formation next to the ore on the north side is a fissile, red slate, richer in iron than the foot-wall slate, and commonly called the 'red slate hanging,' but the actual hanging wall above the ore in the plane of the formation is hard jasper.

It is probable that there has been some movement parallel with the formation in the 'red slate hanging,' as this has been observed in other parts of the range, but it has not been nearly as great as that in the foot-wall slates. In addition, at about 200-ft. intervals, small cross-faults dislocate the formations a few feet.

The deposit was originally mined by square-set rooms and pillars, about 60% of the ore being taken from the initial openings. Some of the pillars were robbed before the hanging caved, and, after this occurred, much of the crushed ore from the pillars and floors was mined by sub-levels and the caving system, especially in the upper part of the deposit. There remains a mass of broken ore and timber, mixed with rock, some of which came from the hanging wall, and some from old square-set rooms that had been filled. On the surface the effects of the mining operations are not uniform. In the western and upper portion of the deposit the back broke through to the surface, running down much of the sand and gravel which covers the lode everywhere here to a depth of 25 to 30 ft. This breaking down of the hanging continued east to a point where the height of the ore deposit and the thickness of the capping were approximately equal, a point which coincides very closely with one of the cross-faults. East of this point the hanging wall has settled bodily, from nothing up to 15 ft., the greatest subsidence being on the foot-wall side and at the west end, near the cave that broke through, and diminishing toward the north and east as the thickness of the capping increases. The whole mass of the hanging wall has slipped down along the foot-wall slate, and has cracked along the red slate on the north, although the movement has not been great there. The east end of the subsidence is marked by a small crack which corresponds to one of the small cross-faults. On the north side of the limit of the cave, where it came through to the surface, is a plane between the vertical and a line perpendicular to the formation; but where the whole hanging has settled, the north limit of the movement on the surface lies approximately over the orebody for its full extent. Underground the whole hanging wall, east of the break that reached the surface, has settled about 75 ft., approximately half the height of the original orebody, and the highest point of the orebody is now along

the north side, whereas it was originally highest along the foot-wall. The capping caved first on the foot-wall side, where it came together with the foot-wall over the ore, and most of the openings seem to have been filled from that side. The caving seems everywhere to be intimately connected with lines of faulting, any tendency to form self-supporting domes or arches having been entirely overcome.

The following figures will give a good idea of the proportions of ore-extraction to subsidence on surface:

	Cubic feet.
Original volume of orebody	7,680,000
Present volume of orebody, including rock, timber, etc.	2,360,000
Volume of material removed	5,320,000
Volume of material removed under cave	2,300,000
Volume of material removed under subsidence on surface	3,020,000
Volume of cave on surface	790,000
Volume of subsidence on surface	1,430,000

$$\frac{\text{Volume of cave on surface}}{\text{Volume of ore taken from under it}} = \frac{1}{2.91}$$

$$\frac{\text{Volume of subsidence on surface}}{\text{Volume of ore taken from under it}} = \frac{1}{2.11}$$

The first of these ratios is very near the proportion frequently assumed in the iron country, namely, one cubic foot of caving on surface to every three feet of ore hoisted. I know of no other subsidence of the hanging as a whole, where the relationship of volume has been worked out. It seems probable that the proportions will vary substantially according to the relative amounts of capping and ore.

Shaft-Sinking on the Rand.—In a paper read before the North Staffordshire Institute of Mining & Mechanical Engineers, and reported in *The Iron and Coal Trades Review*, Alfred Redfern describes some interesting features of deep shaft-sinking on the Rand. The deeper shafts are of rectangular shape, timbered throughout, and divided into seven or eight compartments. Timber was the best medium for securing the sides in rectangular shafts. It was most expeditious for fixing, as both sinking and timbering operations were carried on simultaneously. It also had a long life of service, Rand conditions being exceptionally favorable, and the shafts being fairly dry, and the sides usually strong ground. With good workmanship, and when treated with creosote or other preservative, the timber would last the whole life of a mine. The water had a preservative rather than a destructive action, and it was rarely necessary to renew the timber by reason of ground movement or weighting. The general arrangements were six hauling or winding compartments 5 ft. 6 in. to 6 ft. 6 in. square, one pump and power transmitting compartment of the same size, and a ladder-way 3 by 6 ft., with platforms 18 ft. apart vertically. The latter was compulsory under the Transvaal Mines Act, in mines having only one outlet to the surface. After sinking was once started, it was proceeded with continuously, without stoppage for week-ends or holidays, except in case of accident or breakdown, each 24-hr. day being divided into three shifts of eight hours each. Each gang consisted of two whites with about 80 natives, and each chargeman fired his respective blast, or round of shots, at the end of his shift. The explosive used was blasting gelatine, averaging a little over ½ lb. to each hole. The cartridge was ⅞ by 4½ in.; the detonators were No. 6 and 8, fired with safety fuses, cut in 8-ft. lengths, three to a ring or coil. When all the holes, usually 50 or 60, were charged, torch lamps were lighted, and one white man ascended in the bucket to the lighting stage, switched off the current, and wound up the cable and lamps. The chargeman instructed his assistants as to the order in which the fuses must be lighted, and gave the word, 'fire'. The chargeman lighted the centre row of sumpers, and took care that the others did not get in front of him in lighting the side holes. On the coolness and dexterity of this lighting the success of a blast often depended, for if each shot was lighted in proper order the stone was released in definite and pre-arranged sequence, and with the maximum effect. It was a good practise to burn a warning fuse, that was, a fuse of equal length to those used in each charge, and hung over the side of the bucket. It was lighted immediately before the first shot, and from its rate of burning, warning might be given by the 'boy' left in the bucket to hold the signal wire. The chargeman was the last to travel the length of the shaft, noting if all the fuses were burning. He then climbed into the bucket and gave the final signal, 'clear'. The relieving chargeman usually met the men coming off at the shaft-mouth, and together they counted the reports as the charges exploded, and checked them with the holes drilled and charged. When satisfied that all charges had exploded, the two white men, with several of the most experienced 'boys', descended to lower the electric cables and lamps, and after the sides were trimmed of loose-hanging rock, 'lashing' was commenced, and occupied 2½ to 3½ hours. Drilling was then begun, and the winding engines and all buckets were used by the timbermen. While 'lashing' was in progress, the timbermen were occupied in blocking and wedging sets. Where sufficient cheap labor was available, hand-sinking compared favorably with machine-sinking, both as regards economy and speed.

A novel temperature indicator for hardening steel has recently been introduced by an English firm. Its utility is founded upon the fact that when carbon steel is heated to about 730°C. it becomes non-magnetic, and fortunately this temperature is the best point at which to harden tools. The indicator consists of a permanent magnet, shaped conveniently for holding in the hand, its poles being prolonged by rods of special metal, which remain magnetic at temperatures higher than the hardening temperatures of carbon steels. A small object is held upon the fingers of the gauge above a vessel of clean brine. On the object being heated by a blow-pipe flame, directed from above, when the correct temperature is reached it will automatically slide off the gauge into the brine and be quenched. While particularly adaptable for small tools, it can be used to advantage for large ones.

CONTINUOUS VACUUM-FILTER MACHINE.

Written for the MINING AND SCIENTIFIC PRESS
By BERTRAM HUNT.

In an effort to produce an efficient continuous filtration device for use in cyaniding slime, I designed a vacuum-filter, which contains features that promise high efficiency. The machine may have a stationary filter-bed or one with a revolving filter-bed. In the first form, the filter-bed is an annular chamber, the top of which constitutes the filtering surface. The filter used is a form of sand-filter which I first applied over fifteen years ago, and have used most successfully in leaching gold-slime.

In making the filter-bed, slats of triangular section are placed side by side but not touching, a space of about one-quarter or three-eighths of an inch being left between the bases of the slats. Carefully screened gravel, as nearly uniform in size as possible and too large to pass through the openings between the bases of the slats, is then placed in the lower part of the bed. Above this finer gravel or coarse sand is spread in a layer about 1 in. deep to form a floor on which is spread clean sand of 8 to 12-mesh size, to a thickness of an inch or so above the tops of the triangular slats. This forms the permanent filter-bed and is supported strongly enough to remain perfectly rigid on the application of a vacuum in the chamber underneath. This chamber is connected with a wet-vacuum pump or other machine which withdraws the solution and maintains the vacuum.

The walls of the structure may be made of concrete, and these being raised a couple of inches above the top of the filter-bed constitute circular tracks on which a carriage revolves. This carriage has an iron scraper in front, which is of the same width as the filter-bed, and removes the layer of residue from the permanent filter-bed. The residue is removed from the scraper by a screw conveyor, or by sluicing when water is available for that purpose, and is carried to the hollow central pillar of the machine from which it is carried outside by a conveyor or by water.

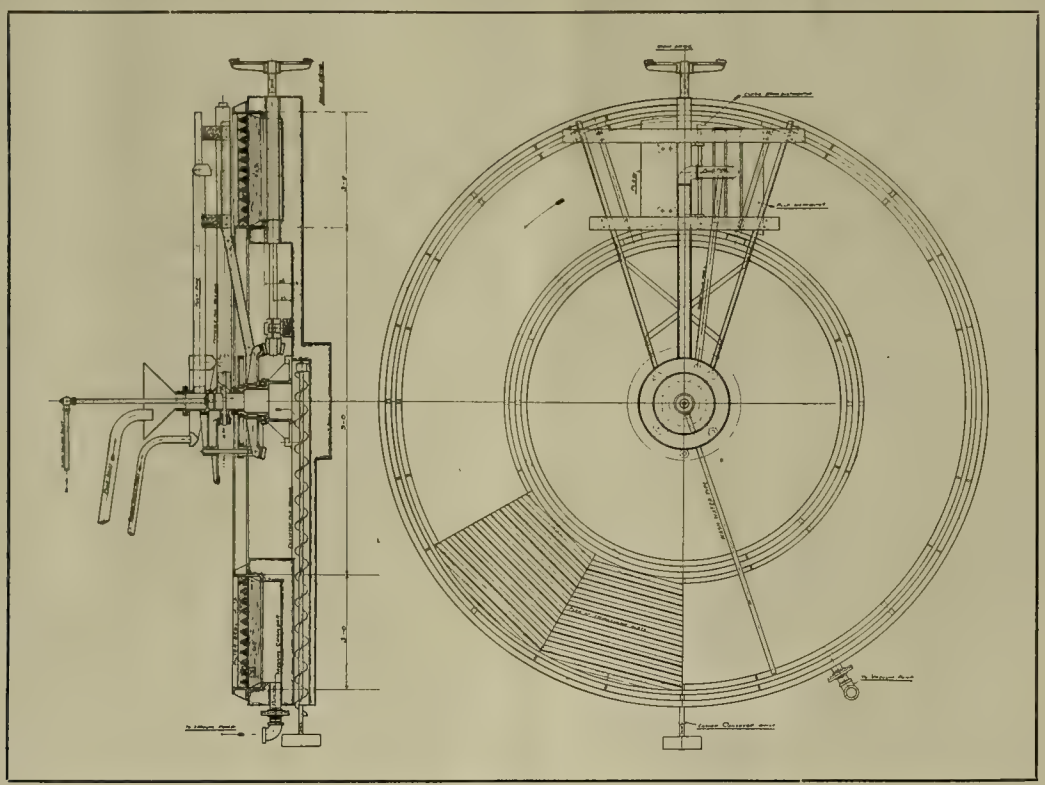
Following close behind the scraper, on the carriage, is placed a distributor similar to that used on a Frue vanner, which distributes the sandy portion of the pulp. Behind this is a second distributor which spreads the slimy portion of the pulp over the layer of sand just laid down by the first distributor. On the central column of the machine are two concentric hoppers or funnels, which are connected by pipes with the two distributors, and which receive the pulp. Before reaching the filter-machine the pulp is roughly classified, so that a portion of the sand is separated in a clean condition, and this clean sand is fed upon the filter-bed by the first distributor, the rest of the pulp going to the second. In this way the slimy portion of the pulp is always distributed over a layer of clean fine sand. As the carriage moves continuously the deposited layer of sand and slime is also continuously removed by the scraper, while fresh material is deposited by the distributors, as described above. Pipes to spray wash-solution or wash-water follow the carriage at suitable distances, so that the residue can be thoroughly washed.

When it is desirable to keep the strong solutions separate from the weak, the vacuum-chamber underneath the filter-bed is divided by partitions into a number of sections, the outlet from each section being equipped with suitably connected valves. These valves would be operated automatically so as to discharge the strong solution separately from the weak. Such an arrangement is an added complication, and in the majority of cases proves to be unnecessary. In the case of a plant in which leaching is done by percolation in vats it is easy and usually desirable to keep the strong and weak solutions apart, but a modern plant practising fine grinding and agitation, followed by mechanical filtration, the conditions are quite different. A machine which has to run continuously should be as simple and as nearly valveless as possible. In those instances in which it is desirable to keep the strong solution separate, two filter machines should be worked tandem, the strong solution being withdrawn from the first, and the washings from the second.

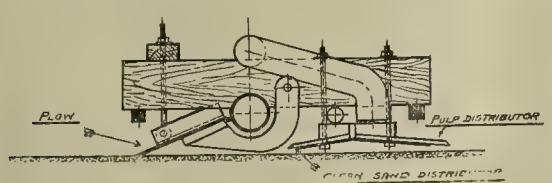
The machine illustrated herewith has an extreme diameter of 15 ft., the annulus being 3 ft. wide. This gives a filter-surface of 113 sq. ft. On the supposition that the layer of residue contains 50% moisture and weighs 109 lb. per cubic foot, if it is ¼-in. thick, it will amount to 2.26 cu. ft., and will weigh 246 lb., or 123 lb. dry. At a speed of one revolution of the carriage per minute this represents an output of 3.69 tons of dry material per hour, or over 80 tons per day. I have taken 50 tons per day as my estimate of the net capacity of this size of machine.

A great deal has been published recently regarding the troubles incidental to the use of canvas or filter-cloth in filter-presses and vacuum filter-machines. The cost of repairs and renewals is large, and there is a necessity for periodical soaking in hydrochloric acid to remove the incrustation of lime salts, and for the employment of a subsidiary filter to clarify the solutions. With a sand-filter properly arranged these troubles do not exist. A clear filtrate is always obtained, and no subsidiary filter is required. This means a considerable saving in itself, and the elimination of the acid-treatment means a further economy as compared with canvas filters. Whenever it is desirable to clean the permanent filter-bed, the scraper, which is adjustable, is lowered, and the carriage revolved so as to remove the layer of sand above the tops of the triangular slats. Clean sand is then spread over the surface to the proper depth, the scraper is adjusted, and the machine is at once ready for work again. Little appears to have been done in the use of sand for filtering in hydro-metallurgical work. Possibly the reason has been in the difficulty of preserving a thin layer of sand without disturbing or washing it away. The distribution of a thin layer of slimy material on the top of a layer of sand from a slowly moving carriage with the consequent minimum disturbance of the sand layer, forms an ideal condition for rapid filtration. A continuous machine has many advantages in operation.

The load on the machine is steady, and the attendance required is small. A filter-machine of the size illustrated will require less than one horse-power to drive it, and four horse-power to maintain the vacuum. When a continuous filter-machine has been regulated as to the amount of feed, the rate of revolution of the carriage, and the speed of the vacuum-pump, it is practically automatic in operation, and the only attention required is to keep the bearings oiled. With vertical filter-surfaces only very fine material can be treated to give a cake that is uniformly permeable. As these machines all work intermittently a considerable thickness has to be accumulated on the surface of the filter-bed to form one charge, and consequently the efficiency of the filtration is progressively impaired and becomes slower and slower from the commencement to the completion of the cake. With a horizontal filter, working in unison with gravity, very coarse or very fine material, or both together, can be handled efficiently.



Hunt Continuous Slime Filter.



Detail of Carriage.

Further, by depositing the material to be filtered in a very thin layer on a horizontal filtering surface of sand, the removal of the solution and the washing are done nearly instantaneously, and the continuous removal of the residue and the deposition of fresh material makes the efficiency constant.

A novel battery cell, described in a paper read before the American Electro-Chemical Society, consists of electrodes of aluminum and magnesium in a solution of aluminum sulphate, to which some hydrogen peroxide is added. Aluminum behaves in a peculiar manner in contact with dissolved air, or oxygen, and becomes electro-negative to a similar aluminum electrode in water free from dissolved air. Magnesium does not show this effect; hence a cell with the two metals for electrodes has a comparatively large electromotive force developed when dissolved air or oxygen is introduced. The effect is considerably increased by adding hydrogen peroxide. Tests were applied to the water in which clean aluminum had stood for a few hours, and a measurable quantity of hydrogen peroxide was detected. This was developed from the action of the dissolved oxygen on the aluminum, probably according to the following reaction,

$$2Al + 6H_2O + 6O = Al_2(OH)_6 + 3H_2O_2.$$

The amount of yield of the peroxide was considerably increased in several ways. Without dissolved air no trace of peroxide was observed. The generation of the hydrogen peroxide explains the abnormally large electromotive force developed between two metals so close together in the electrochemical series.

Japan's coal production during 1907 amounted to 13,716,488 tons.

METALLURGICAL CONDITIONS AT COBALT, CANADA.

By F. N. Flynn.

*With the discovery of the Cobalt camp, there were presented to mining and metallurgical engineers several problems, which made even the most capable and experienced pause before passing an opinion. To this day many of these questions are unanswered to the satisfaction of those who are developing the camp. The mining engineers were asked: "Will these narrow veins go down, and will their silver content continue in depth?" The metallurgists were asked: "How can we get the most dollars from our ores?"

The veins are found in the Keewatin, Lower Huronian, Post Middle Huronian, and more recent formations. Their pitch is nearly vertical. They open and close frequently, both vertically and horizontally. The Lower Huronian veins are the most constant, the Post Middle Huronian ranking a close second. The veins outcropping in the Keewatin cannot be referred to in a general way, but some of the best veins are found in this formation. It is generally conceded that veins which are constant in the other formations, are apt to pinch out when they enter the Keewatin.

The veins are narrow, all under 28 in., probably averaging 4 in. wide, and according to the Provincial geologists they contain the following minerals:

1. Native elements.—Native silver, native bismuth, graphite.

2. Arsenides.—Niccolite or arsenide of nickel (NiAs). Chloanthite or diarsenide of nickel ($NiAs_2$). Smaltite or diarsenide of cobalt ($CoAs_2$).

3. Arsenates.—Erythrite or cobalt bloom, $Co_3As_2O_8 + 8H_2O$. Annabergite or nickel bloom, $Ni_2As_2O_8 + 8H_2O$.

4. Sulphides.—Argentite or silver sulphide, Ag_2S. Millerite or nickel sulphide, NiS.

5. Sulph-arsenides.—Mispickel or sulph-arsenide of iron, FeAsS. Cobaltite or sulph-arsenide of cobalt, CoAsS.

6. Antimonide.—Dyscrasite or silver antimonide, Ag_6Sb.

7. Sulph-antimonides.—Pyrargyrite or dark red silver ore, Ag_3SbS_3. Tetrahedrite or sulph-antimonide of copper, $Cu_8Sb_2S_7$.

Some of the veins have the ore concentrated in one seam, lying loosely between two perfect walls, the line of separation being distinctly marked, usually by a film of mud. Such veins can be stripped clean in mining, providing the width and grade justify stripping the gangue before taking down the ore. Another type of vein has the ore 'frozen' to one wall. A third type contains several 'stringers' of ore entering and leaving the main vein, leaving gangue rock between them. With these two types the walls are not always clearly defined, and it is usual to drive in the ore, that is, to cut behind the walls with the main drive, sufficient to take down the outside stringers. By keeping the drill-holes away from the ore and loading them with just the right amount of dynamite, this method can be followed without producing an undue amount of 'fines.' A fourth type may have irregular walls and consist mainly of calcite and native silver, with sheets and flakes of silver penetrating the wall-rock at all angles from the main vein. These veins produce a large quantity of 'cobbings.' In this refuse material the flake silver is quite visible before crushing, but is so thin as to produce little or no 'metallics' after crushing, the gangue being very hard. Another similar type contains the bulk of the silver as argentite instead of native, or as a mixture of both. These veins are not so frequently encountered as the preceding, but produce a larger tonnage of mill-rock than any in the district.

The mixed vein matter is treated on one or more bumping tables. These are frequently 4 by 15 ft., hung by inclined bolts from overhead timbers, having a fall of 1 ft. in 15. The forward motion is about 4 in., imparted by a cam-shaft at varying speed. The floor of the table consists of two steel plates and one perforated plate. The material is fed from a bin at one end, and sprayed continuously with water from the mine pumps. The perforated plate has ¾-in. holes, while the under screen has ⅛-in. holes. This gives the sorters washed rock ¾ in. and larger, while the undersize ¾ in. to ⅛ in. and water, along with the coarse waste from the end of the table, drop into their respective bins below. One table handles 50 tons per shift with six men, including car-men. By arranging separate dumps for all these materials they can be more readily marketed, or treated by different processes. The shipping ore is usually crushed to one inch and sewed in bags containing from 75 to 150 lb. The following statement, from a paper read by Dr. A. R. Ledoux at the Toronto meeting, 1907, gives the only accurate published information of the average assays of cobalt silver ores in carload lots:

							Per cent.
Over	6,000 oz.			4	lots	(say)	1.00
Between	5,000 "	and	6,000 oz.	3	"	"	0.75
"	4,000 "	"	5,000 "	12	"	"	3.00
"	3,000 "	"	4,000 "	17	"	"	4.25
"	2,000 "	"	3,000 "	30	"	"	10.00
"	1,000 "	"	2,000 "	72	"	"	18.25
"	900 "	"	1,000 "	11	"	"	2.75
"	800 "	"	900 "	7	"	"	1.75
"	700 "	"	800 "	12	"	"	3.00
"	600 "	"	700 "	21	"	"	5.25
"	500 "	"	600 "	10	"	"	2.50
"	400 "	"	500 "	13	"	"	3.25
"	300 "	"	400 "	20	"	"	5.00
"	200 "	"	300 "	44	"	"	11.25
"	100 "	"	200 "	66	"	"	17.00
Less than	100 "			43	"	"	11.00

"Silver, of course, in point of value, is the more important element. The highest percentage of cobalt found in any one shipment is 11.96%, the average being 5.99%. The highest assay for nickel in any carload is 12.49%, the average being 3.66%. The highest percentage of arsenic is 59.32, the average being 27.12." A complete analysis of two carloads, which is given herewith, reveals the exceeding complexity of the ores, the high metallic content, and the extraordinarily small amount of silica and alu-

*Abstracted from *Jour.* Can Min. Inst.

mina present. The analysis as given is upon the dried sample.

	Per cent.
Silica	3.34
Iron	1.78
Alumina	0.27
Lime	5.85
Magnesia	4.63
Copper	0.09
Nickel	13.87
Cobalt	8.36
Bismuth	trace
Silver	5.31
Antimony	1.46
Arsenic	42.46
Carbonic acid	9.26
Chlorine	0.08
Sulphur	1.89
Combined water, alkalies, and oxygen, by difference..	1.35

For the moment the main object in milling is to win more ore from the waste, cobbings, and screenings. The treatment of the wall-rock proper will be the second step. Mixed material difficult to 'cob' will undoubtedly add considerably to the output, but on account of its physical 'make-up,' and the fact that the ores of the district occur in the massive form, the crushing will produce a considerable quantity of slime. Stamp crushing should not be considered in concentration. Roll crushing, with a large slime-treating capacity, may serve for the present, but ample provision should be made for storing the slime separately. If the concentration process is confined entirely to the recovery of the arsenides, the extraction, plus the recovery of slime as such, should be quite satisfactory. On the other hand, should concentration be attempted on the wall-rock ores carrying native silver in very thin flakes and as argentite, the results cannot possibly prove a financial success, unless the tailing is to be re-treated by another process. The native silver flakes and argentite ores must be treated chemically if milled, preferably by amalgamation for the native silver, and by cyanide for the argentite ores, whereas the slime from concentration might be treated by the 'oil process.' At present there are six new concentrators in the camp, three in operation and three nearly completed. One plant is designed to treat the tailing by cyanide; the other by amalgamation.

The bulk of shipments from the camp have gone to the custom smelters of New Jersey, and as the ore is exceptionally rich, and special facilities are required in the sampling, it is almost invariably sampled at the public sampling works. Shovel sampling is preferred to mechanical samplers. Here in the presence of representatives from buyer and seller, the sacks are weighed in lots of ten, by a public 'sworn weigher.' The ore is crushed, rolled, and rerolled, the nuggets of silver being picked out by hand between each handling. The nuggets are weighed and deductions made. These are usually sold to the custom refineries as a separate transaction. The finely-crushed and thoroughly-mixed material is now completely sampled four successive times. The smaller samples are screened, and the 'metallics' are subjected to a further grinding in small pebble mills. The four samples vary widely in their values, in spite of all precautions. Cobalt and nickel are not paid for by the custom smelters in the United States. The ore carries no gold. Silver is the only determination necessary in most cases. This is determined by wet and dry methods on all ores carrying arsenic in quantity. The nuggets are melted in large crucibles and cast into bars. The resulting slag and speiss are weighed, sampled, and assayed as usual. The bars run from 700 to 875 fine.

The sampling of a mine dump by grab-sampling is not worth the cost; the metals are not homogeneously contained in the rock. The 'fine stuff' is invariably the richer. The silver in the coarse rock is in the crevices; whereas the body of the rock, without cleavage planes, is barren, so that, in chipping pieces from the larger rocks, one invariably gets a greater proportion of silver than the whole rock contains. To determine the value of the dump, a large quantity should be crushed and finely ground before sampling.

Let us assume that concentration, followed by a chemical process in special cases, will solve all the low-grade ore problems. This means a larger output of arsenical ores to be smelted. In the earlier days of the camp a considerable tonnage of arsenical

McKinley-Darragh Mine at Cobalt, Ontario.

ore was shipped to Europe, where, in some cases, the four metals—silver, cobalt, nickel, and arsenic—were paid for at very satisfactory prices. For various reasons, many of which are inexplainable at this end, the European metallurgists either declined to take any more shipments, or declined to pay for all four metals. Others later on declined to pay for nickel and arsenic, and at last only paid for the cobalt. The result is that those producing smaltite ores without silver occasionally market a carload in Europe. The silver mines have practically discontinued European shipments. The New York ore buyers paid for the arsenic, silver, cobalt, and nickel as late as August 1905, when they discontinued payments for the arsenic, cobalt, and nickel. The new schedule, given out at that time, by the New Jersey smelters, charged 6% of the silver, and later they imposed a treatment charge of $8 per ton. As the European market declined, the treatment charge was raised to $9 and then to $15 per ton, with a silver deduction of 7%. Then followed the penalty for insoluble silica and arsenic. Later one-half cent per ounce was deducted from the price paid for the silver, and various other deductions followed, until a condition was reached where one smelter, unless the

mine owners would make a time contract at increased treatment charges, declined to accept any more ore. Strange to say, the other smelters, including the European plants, were at this critical time 'overstocked' with cobalt ores. After the mines had accepted the inevitable, the smelters broadened their field of operation, and allowed shipments to be made without restriction as to tonnage especially for wall-rock ores, which contained little or no arsenic. The new schedules still impose a heavy arsenic penalty on ores under 1500 oz. In December 1905 a carload of ore was shipped from Cobalt to England direct. The liquidation shows:

Weight—17 tons, 16 cwt., 3 qr., 3 lb.
Contents—Ag 30,921.24 fine oz.
Co 4,275 lb.
Ni 2,496 lb.
As 13,679 lb.

Liquidation:
92% of silver contained

	£	s.	d.
30,715.11 standard oz. at 30.5187d. (average)	3910	16	4
4275 lb. Co at 2s. per lb	427	10	—
2496.9 lb. Ni at 6d. per lb	62	8	6
13,679 lb. As at ¼d. per lb	14	5	—
Total credits	£4414	19	10
Freight, Cobalt to Liverpool, and insurance	£51 3 2		
Ry. Exp. in England	38 2 7		
Paris Chg. nickel, etc	10 — —		
Assaying	35 — 6		
Silver refining expense	24 15 4		
Total debits	£159	1	7
Net credits	£4255	18	3

The schedule offered by the American Smelting & Refining Co., Maurer, N. J., 1908, is: For ores under 1500 oz., pay for silver 93% of contents at New York quotation, less ½c. per oz., at quotation 30 days after agreement on assays. Charge for insoluble silica, 7c. per unit; for arsenic in excess of 5%, 25c. per unit; for treatment, $9 per ton. For ores over 1500 oz.; these are not purchased outright. They are cupelled in the refinery and paid for as follows: Pay for bar silver recovered from cupellation at New York quotation, less 1c. per oz., for 100% on date of agreement on assays. Pay for the silver contained in the by-products from cupellation at New York quotation, less ½c. per oz., for 98% of contents, at quotation 30 days after agreement of assays. Charge for treatment, $125 per ton of ore.

The schedule of the International Nickel Co., Copper Cliff, Ontario, 1908, is:

Ag pay 94%, when 4000 oz. or over.
" 93%, " 1200 " "
" 92%, " 800 " "
" 90%, " 500 " "
" 85%, " 300 " "
" 80%, " 150 " "
Co pay $30 per ton of ore for 12% or over.
" $20 " " " " 8%
" $10 " " " " 6%

No payment is made for less than 6% cobalt, nor when the nickel content is higher than that of cobalt. Payment is made in two installments at 45 and 90 days respectively, after sampling the ore, and is based on the official value at New York on the first day of settlement. The purchaser reserves the right to pay in silver bullion delivered at New York in place of cash.

The Swansea smelters in 1907 bought low-silver cobalt ores, without regard for silver contents, and without any deduction, f.o.b. cars at Cobalt, as follows:

8% to 10% cobalt .....30c. per lb.
10.1% " 12% " .....35c. "
12.1% " 14% " .....40c. "
14.1% " 16% " .....45c. "
16 or over " .....50c. "

These prices give net returns of from $48 to $160 per ton. The Swansea smelters raised their schedule of payment in 1908 five cents per pound.

Very recently German buyers have entered the field, and have purchased certain classes of ores at figures which are satisfactory to the Cobalt producers. They have bought several carloads of ore on the following basis: For ores containing not less than 10.5% of cobalt, and not less than 30 oz. silver per ton, there will be paid $81.82 per ton, on the following conditions, f.o.b. cars, Cobalt: Purchaser pays freight. Sampling by Ledoux & Co., Bergen Junction, N. J. The cost of sampling to be divided. Ledoux & Co.'s assays will govern settlement.

This would net say $80 per ton.

The most serious difficulty at the present time is the uncertainty of the cobalt market. The European buyers occasionally cable instructions to "ship 50 tons cobalt within one week," whereas the miner is not prepared to deliver in so short a time. It is not mined until a market is found for it. Should he ship, he might wait six months before receiving another offer.

It seems scarcely necessary to add that the market price of silver today would materially change these results, and that contracts for time or tonnage on the entire output of all classes of ores produced would result in slightly better terms.

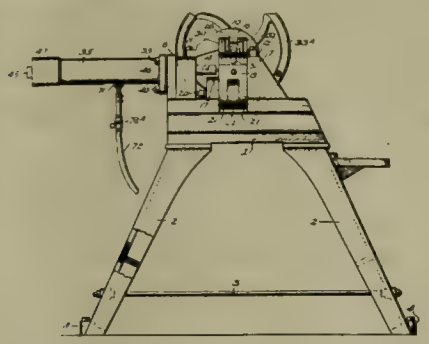
In the lead cupellation process the advantage is that many difficulties and uncertain results in sampling and assaying the rich crude ores are eliminated. The disadvantage is that the losses resulting from handling, flue dust, and volatilization fall on the seller. Roughly, about 60% of the silver is recovered in bars. The advantage of eliminating an uncertainty in sampling and assaying is as beneficial to the smelter as to the seller. On the other hand, the metallurgical losses are always borne by the seller. This loss, in addition to a treatment charge of $125 per ton, and deductions from the percentage of silver paid for in by-products, as well as from the market price paid for the silver in both instances, and together with the fact that the seller is not paid for his cobalt, nickel, and arsenic by the New Jersey smelters, appears to the average miner as a condition wherein the term 'modern metallurgy' is a delusion.

Mining costs by contract in the State of Jalisco, Mexico, as shown in a recent report by the El Favor Mining Co., averaged as follows for the year 1907: Driving 1463 ft., ₱6 per ft.; sinking 318 ft., ₱9.75; raising 209 ft., ₱5.25; and cross-cutting 336 ft., ₱5.87 per foot.

MINING AND METALLURGICAL PATENTS.

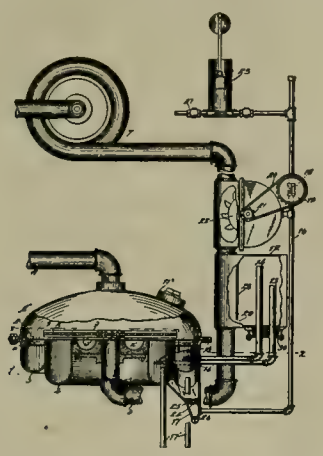
Specially reported for the MINING AND SCIENTIFIC PRESS.

ROCK-DRILL SHARPENING MACHINE.—No. 896,166. Charles H. Shaw, Denver, Colorado.



In a drill sharpener, a supporting bed, a vise for holding the drill, a cylinder secured to the bed, a cylindrical shell reciprocably mounted in said cylinder, a hammer reciprocably mounted in said shell, a die-bar supported by the shell in axial alignment with said vise and drill, and arranged to project into the path of the hammer, an additional die support fixed on the bed, means for actuating the hammer, and means for moving and holding the die-bar against the end of the drill during the stroke of the hammer against it.

HYDRAULIC SEPARATOR AND CLASSIFIER.—No. 896,471. Charles E. Seymour, Placerville, California.

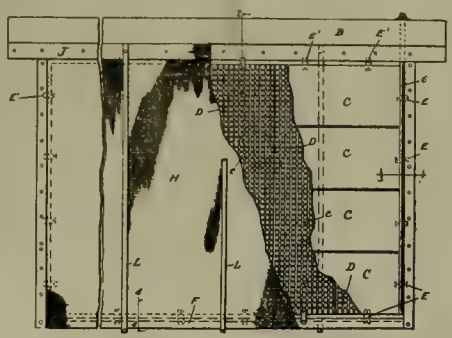


A classifying apparatus having in combination a separating chamber in which the operation is carried on, a feed-pipe leading to said chamber to convey the material to be treated under continuous pressure, said apparatus having a supplemental classifying chamber below the separating chamber, a screen dividing said chambers, said apparatus having a hydraulic sizing chamber connected with said feed-pipe, and said sizing chamber having a discharge conduit leading therefrom and discharging tangentially into said supplemental chamber, whereby there is produced a rotating motion of the contents of said chamber.

AMALGAMATOR.—No. 896,169. Eugene Stevens, Boulder, Colorado.

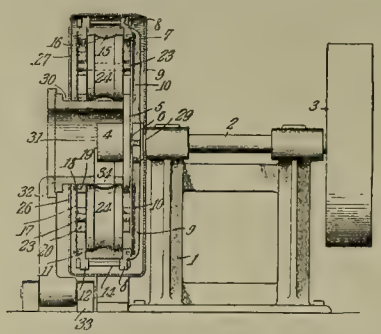
In combination, a sluice or box having transverse amalgamating pockets adapted to contain mercury, and draw-off outlets in said pockets; with a removable cover adapted to cover any pocket to permit the latter to be emptied, said cover having an opening in it to permit access to the pocket covered thereby, substantially as described.

FILTER-FRAME.—No. 896,436. Galen H. Clevenger, Palo Alto, California.



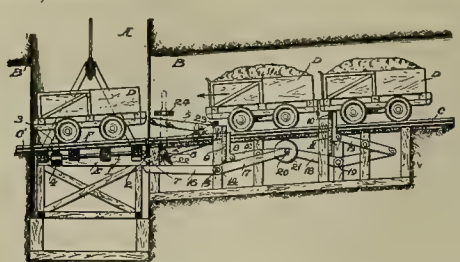
A filter-frame comprising a frame, a filler-plate within the frame having transverse and longitudinal interconnecting grooves on its outer surface, a filtering medium surrounding the filler-plate, and means for detachably securing the filtering medium to the top and ends of the frame.

MACHINE FOR PULVERIZING ORE.—No. 896,954. Frederick W. Thomson, Fort William, Ontario, Canada.



In an ore-pulverizer the combination with oppositely disposed screen heads and a die ring detachably mounted and clamped between the heads, one of said heads having a central opening; of a tubular device projecting through the opening and bearing against the opposite head, said device having an outlet opening, driving means connected to one of the heads, a pivoted support for the feed device, and a plurality of connected crushing rolls movable around the feed device and upon the die ring, said rolls being disposed to travel longitudinally of the outlet in the feed device.

MINING APPARATUS.—No. 896,467. Alonzo P. Sands, Maryville, Illinois.



In a mine apparatus, the combination with a car track and a hoisting cage, of car restraining means carried by said cage and comprising a rock shaft having a dog at its forward end adapted to control a car while upon said cage, and a crank arm at its rear end, and means associated with said car track adapted to be engaged by cars while moving on said track and engaging the crank arm so as to actuate said car-restraining means, substantially as set forth.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

GOLDFIELD MINING TROUBLES—RIGHTS OF UNION AND NON-UNION MEN.

In the settlement of the Goldfield mining and labor troubles United States District Judge Farrington decided several points of interest to miners and to union and non-union laborers. In an action for injunction by the Goldfield Consolidated Mines Co. against the Goldfield Miners' Union, Judge Farrington established the principle that the agreement between mine operators not to employ union laborers was not an unlawful conspiracy. He also held that workmen, when free from contract obligations, have a legal right, singly, collectively, or as a union, to quit work or 'strike,' and they have the right to use such lawful means to make the strike effective as are not inconsistent with the rights of others; and on this theory they have the right by peaceful argument and persuasion to endeavor to secure the co-operation of non-union men, employed in the place of the strikers to quit work provided the persuasion is of such a character as to leave them free to do as they please, and that they were not persuaded to do that which would be unlawful for them to do. The principle was also established that non-union miners have the right to seek employment, to come and go from their work, or to go where they choose on the public thoroughfare, without molestation, threats, violence, or insults of any kind, and without being picketed, against their will, to listen to persuasion or arguments. And that striking union miners who assailed non-union miners with threats, ridicule, or insult, or who followed them to or from their work with vile language and abusive epithets, in order to induce or compel them to quit work, or to refrain from offering to work, were guilty of unlawful conduct. That any attempt to intimidate a person in order to compel him to refrain from exercising a legal right, is unlawful. That peaceful picketing is not only possible, but permissible, and so long as it is confined strictly and in good faith to the gaining of information, and to peaceful persuasion and argument, it is not forbidden by law; but when used for purposes of intimidation it is unlawful. The massing of large and unnecessary numbers of pickets at a point which must be passed by non-union men, whom the strikers desired to influence, was in itself an act of intimidation. And when the Miners' Union knew that the pickets were carrying out a common purpose in the intimidation of non-union men in order to compel them to quit work, and it still continued to operate with and supervise the pickets, the court had the right to conclude that there was an agreement between the union and the pickets to do unlawful acts, and that the mine operator was entitled to an injunction to prevent the commission of such acts.

Goldfield Consolidated Mines Co. *v.* Goldfield Miners' Union, 159 Fed. 500, March, '08.

RIGHT TO OPERATE MINE—PROTECTION AND RELIEF.

The right to operate a mine and to carry on the business of mining are property-rights, whether the person so operating the mine is the owner or not; and when such rights are interfered with he may invoke the powers of a court of equity to protect them, although he was not the owner of the mine, or even a stockholder in the corporation which owned it.

Goldfield Consolidated Mines Co. *v.* Goldfield Miners' Union, 159 Fed. 500, March, '08.

MINING CLAIM—POSSESSION OF LOCATOR.

An intruder, by a peaceable entry, cannot acquire a right to possession by setting out extension stakes, as against the possession of a mining claim by a prior locator who has complied with the law, and who at the time of such entry was in his possession and was being worked by him as a mining claim.

Biglow *v.* Conradt, 159 Feb. 868, March, '08.

Coal-Carrying Aerial Tramway.

In the fierce race for supremacy which obtains in the operation of mines, to increase the output at the least possible expense, the aerial wire-rope tramway has played an important part. Today competition is so severe that, to survive, operators must equip their mines with every modern appliance. No half-way measures or inferior apparatus for mining and transporting minerals may be tolerated if the tremendous pace is to be maintained. Years ago pack-mules were pressed into service for the transportation of minerals; but mule-power has nearly seen its day, and the substitution of aerial wire-rope haulage is an absolute necessity. Transportation by means of aerial wire-rope tramway is a system perfectly simple in mechanism, inexpensive in cost of operation, reducing transportation costs to a minimum, and it is easily handled, both in installation and maintenance. It is absolutely reliable in action under any and all conditions. It is adapted to the transportation of coal, ore, sand, rock, and lumber, over any contour, and for any length of line from 100 ft. to twenty miles or more.

The economy of wire-rope transformation is fully demonstrated at the mines of the Montana Coal & Coke Co. What for years had proved a rather unprofitable undertaking has been converted into a money-maker by the installation of three Gemmer patent automatic aerial wire-rope tramways. These were the first aerial tramways to be installed in Montana for the transportation of coal, and were built by the Broderick & Bascom Rope Co., of St. Louis.

The town of Electric, Mont., where the Montana Coal & Coke Co.'s property is situated, is nestled picturesquely in a beautiful valley at the foot of Electric Mtn. The valley is 5185 ft. above sea-level. Towering mountains, with peaks clad with snow ten months of the year, surround the valley on every side. So circuitous is the road leading to Electric that, having reached the town, it is difficult to determine the entrance to the valley. A wall of lofty mountains seems to form a complete barrier to the outside world. This town is situated on the Gardner branch of the Northern Pacific railroad, about four miles from the famous Yellowstone Park. Twenty-eight years ago J. Beattie and J. W. Reese operated a coal claim here of 320 acres. This was later taken up by the Horr brothers. The Park Coal & Coke Co., with Horace F. Brown as president, succeeded the Horr brothers, and began to ship coal, and coke was made with a battery of five ovens. Twelve years ago the property again changed hands, coming into the possession of the Montana Coal & Coke Co., the present operators. The property of this Company now aggregates approximately 1400 acres. There are now 255 coke ovens of the bee-hive type, each having an individual capacity of 6 tons of coal, which, after reduction, produces 3⅜ tons of coke. Both 72-hr. and 48-hr. coke is produced, all of which is shipped to Butte, Mont., to the Anaconda Copper Mining Co., the Butte Reduction Works, and the Pittsburg Montana smelter. Before being coked the coal is ground fine and washed in a Luhrig washer.

The coal is in the mountains, and these seams constitute the most disturbed field now being worked in this country. Some veins were thrown 1000 ft. perpendicularly when the mountains were formed. Operating under the conditions prevailing in this mountainous region was both difficult and expensive, because of the extremely crude method of transportation between the mines and the shipping point.

The coal was transferred to the valley below by a relay of large wooden chutes. It reached its destination so badly broken that little of it was fit for domestic use. Early in 1907, Edmund A. Bartl, general manager for the company, was detailed to inspect the property and recommend such improvements as he thought would reduce the cost of production to a reasonable figure. His opinion was that an aerial wire-rope tramway was the only method of transportation that would prove profitable in such a country. Contracts were soon let for three Gemmer tramways, 4100, 7200, and 7800 ft. long, respectively. Ground was broken immediately for the towers, and within 60 days all material for the three tramways was on the way, consisting of 10 car-

loads of machinery and wire rope. Great difficulty was encountered in hauling the material from the railroad in the valley to the places along the line of the tramway in the vicinity where it was to be used. So rough and steep was the road that at times it was necessary to supplement the eight-horse team with rope and windlass.

The 4100-ft. aerial tramway is operated wholly by gravity. The descending loaded buckets keep it in motion and hoist all the empties. Last summer, when the mountain spring from which the mining camp derives its water supply became exhausted, water from the valley was sent up in the tramway buckets. The speed of the line is approximately 300 ft. per minute, and is controlled by three brake-wheels, attached to the main terminal shaft at the loading station, and equipped with brake-bands lined with hard-maple bolts. The main track ropes are Broderick & Bascom's yellow strand 'Powersteel,' 1 in. and 1¼ in. diam. The breaking strains of these cables are 48 and 72 tons, respectively. The traction-rope is the Broderick & Bascom patent steel cable, which is superior to the ordinary crucible cast-steel rope. Tension on all ropes is maintained by automatic weight-boxes. Swivels attached to the ropes permit of their being turned so as to evenly distribute the wear. All the stations on the line are connected with each other and the rest of the plant by telephone. To go by wagon from the loading station to the discharging station takes about one hour, while the buckets travel the entire 4100 ft. in 10 minutes.

Buckets are loaded, transported 4100 ft., dumped, righted, locked, and returned, without power and with little attention. At the mines of the Montana Coal & Coke Co., the coal is hoisted by electric power and dumped into the bunkers of the tramway loading-station. From these bunkers it is drawn into the buckets by an ingenious device known as the Gemmer patent automatic loader. This loader consists of a two-compartment hopper, mounted on trucks, traveling on independent rails. An attendant fills this loader by opening the gates of the coal-bunker. A bucket, on entering the loading station, passes from the stationary track-rope onto a steel rail, but is not detached from the traction-cable. This cable passes around an automatic grip-wheel having 106 pairs of grips in its periphery, which open and close upon the rope automatically, preventing it from slipping. After the bucket passes around the automatic grip wheel it engages a pair of actuating levers which are attached to the automatic loader. By reason of this connection the loader is gradually accelerated to the speed of the incoming bucket, at which time the gates on the loader open automatically, permitting the material to flow into the bucket from both sides, loading the bucket evenly. The bucket and loader, during this operation, travel together a distance of approximately 12 ft., while the loader is automatically disconnected from the bucket, the gates close automatically, and the loader recedes automatically to its normal position, where it is re-charged, while the bucket passes out over the line to the discharging station. An additional attendant is stationed here to operate the levers which control the speed of the line. One attendant could manage the loading of the buckets and control the speed of the tramway, but it is considered safer to employ two because of the steep incline.

Midway on the line is a loading station at a prospect opening. By locking the automatic loader at the main loading-terminal, one or more buckets can be passed through unloaded. Thus, by a pre-arranged plan, every other bucket, or every third or fourth, can be left empty at the main loading-station, to be loaded at the intermediate station, or vice versa.

On the arrival of the buckets at the discharging station an automatic trip releases the tripping handle, allowing the bucket to discharge its contents into a bunker. This operation takes place while the bucket is in motion. It then rights and locks itself and returns to the loading station.

Only three attendants are required to operate this entire 4100-ft. tramway. Two of these are at the main loading station and the other at the intermediate station. Placing their wages at $2.50 per day each, and the daily haulage of the tramway at 300 tons, the cost per ton is 2½c. In the event that the tramway were driven by an electric motor, one man would be sufficient to operate the tramway, as one attendant would be capable of not only handling the levers controlling the flow of the material from the ore-bin into the automatic loader, but he could also control the switch on the motor regulating the power.

There are 14 towers on the line of the tramway, the legs of which are made of round timber cut from the adjoining woods. The caps are of sawed timber made at a mill on the ground. The two tallest towers are 65 and 75 ft., respectively, the latter being constructed in a similar manner to the towers used in the oil fields, built of 2 by 12 in. timbers, the legs forming an angle. The result is a rigid tower at moderate cost. The longest span between towers is approximately 600 ft. The iron saddles for the track-cable, and the brackets supporting the traction-cable sheave on the towers, were cast together, thus maintaining at all times the proper distance between these two cables. All sheaves on the towers and at the intermediate station are of steel, fitted with phosphor bronze bushings.

The Gemmer tramway bucket is absolutely self-operating. The buckets on some systems require an attendant to right and lock them. Others use complicated machinery to do this work. Where a righting rail is used, the bucket often swings outside the rail, resulting in a derailment of the carriage. This bucket is made of heavy sheet-steel, reinforced with steel-angles in the corners. The traction rope is attached to the bucket a few inches above the track-cable instead of considerably below it, as in some types of tramway. In these types there is always a tendency for the upper part of the bucket to hold back while the lower part goes ahead, imparting a slanting position to the bucket. This is particularly true when ascending or descending a grade, as when nearing a tower or in places where the topography is steep.

There are 20 buckets, each having a capacity of 1400 lb. of coal, or 25 cu. ft., spaced at intervals of 410 ft. This gives the tramway a capacity of 30 tons per hour, or 300 tons per 10-hr. day. Twenty more buckets can be added at any time, doubling the capacity, and this will not increase the cost of operation, as the same number of attendants can handle the tramway. The buckets are attached permanently to the traction-cable by means of Brown tramway clips, which ride over the sheaves perfectly, with no tendency to derailment. The connecting pin on the clip is held by a device on the bucket in such a manner that it acts as a swivel. No matter what the gradient, there is no tendency to pull the bucket from its perpendicular position. This is of particular advantage on this tramway, where the gradient is approximately 45° in several places.

The plant of the Montana Coal & Coke Co., which employs 400 men, is now one of the most up-to-date in the country. Montana is one of the most promising coal-producing States. According to Government statistics, 1,829,921 short tons, of a spot value of $3,240,357, was mined in 1906. This is an increase of 186,089 short tons over 1905, or 11.3 per cent.

Publications Received.

THE OFFICIAL MINING DIRECTORY OF MEXICO. Published under the authorization of the Government. Vol. X. Qto., pp. 244, Ill. By John R. Southworth and Percy G. Holms, Mexico City, Mex. 1908. Price $5, U. S. Cy. For sale by the MINING AND SCIENTIFIC PRESS.

The official character of this directory is, of course, only a matter of courtesy, but the publication is well known and has made its own reputation as a valuable guide-book. As such works go, it is inexpensive. It is beautifully printed, the type is large, clear, and open, the maps are abundant and helpful, and the work is sprinkled from cover to cover with handsome half-tones which reveal the leading mines and smelters of the Republic. A short sketch of the history of Mexican mining is given, a re-print of the mining laws, various statistical tables, weights, and measures, a glossary of mining terms, and other appendices. The list of mining companies is classified first as to States, arranged in alphabetical order, and under each State the companies in similar order. The information given under each head-

ing is of the conventional sort, and is ample and stated in accordance with a uniform plan which makes reference easy. It is a work of high value.

Richards Pulsator Classifier.

The Richards pulsator classifier is the invention of Robert H. Richards, the renowned author of the recent book on 'Ore Dressing.' Hydraulic classification of ores has received Dr. Richards' special attention for many years, and the pulsator classifier is the crowning result of an evolution in the form and application of hydraulic classifiers. By its use the size of material treated by concentrating tables is so increased as to make the table preferable to fine jigs; the capacity of the tables is tremendously increased over previous practice, in some cases being more than doubled, and despite the increased capacity of the tables, the recovery effected thereby is greatly improved.

The choice between the use of screens producing a sized feed and the use of classifiers producing a classified feed for the tables, is a much mooted question, each method having its particular advocates. The choice has been influenced principally by the performance of the machines, rather than by a difference between the recovery, treating either perfectly sized or perfectly classified material.

The objections to screen-sizing finely crushed pulp are mechanical. The standard form of revolving screen when used with fine screen-cloth is a ceaseless source of trouble. The efficiency of such a screen is low, requiring for any considerable tonnage a screen of vast proportions. The screen cloth 'blinds,' that is, the openings clog, requiring almost constant attention. Numerous attempts have been made to overcome this trouble with shaking or bumping screens. In all of these the object is first to distribute the ore entirely over the screen-cloth employed, and second to keep the screen-cloth from blinding. It is difficult to keep the shaking or bumping type of screen in repair, as all successful concentrating mills operate 24 hours per day, and the difficulty of keeping a machine which is shaking or bumping at the rate of from 200 to 400 strokes per minute in repair under such conditions can readily be appreciated.

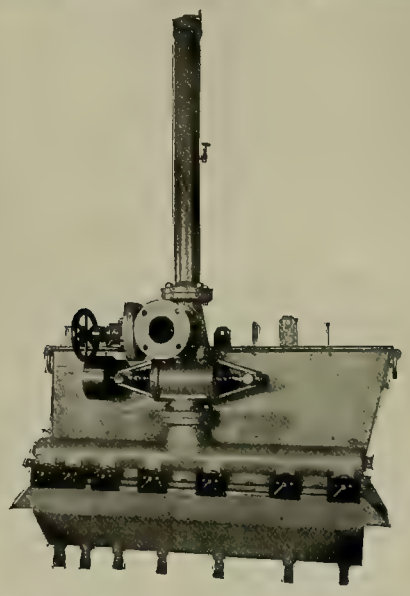
The Richards pulsator classifier is a simple mechanical device, requiring little attention. It is a remarkable machine in its capacity as compared with its size, when considered in comparison with previous forms of classifiers, and in the quality of work it performs, that is, in the perfect classification which it effects. The machine shown in the accompanying illustration is a standard 4-in. six-compartment Richards pulsator classifier. It has a capacity of from 150 to 200 tons of ore in a properly thickened pulp per 24 hr., which it delivers in six different classes. Standard spitzkasten are seldom used for more than four classes of product. One spitzkasten handling 150 tons of thickened pulp would be of prohibitive size, and in practice two machines, each handling 75 tons per 24 hr., would be installed. Assuming that these two spitzkasten are set side by side, the comparison between the Richards pulsator classifier and the spitzkasten is as follows:

FOR A DUTY OF 150 TONS PER 24 HOURS.

	Richards Pulsator Classifier.	Spitzkasten.
Number of products	6	4
Total weight (pounds)	2,000	17,400
Length over all (feet)	6	40
Height over all (feet)	3½	9
Maximum width over all (feet)	2 2-3	25
Maximum fall; feed to lowest-delivery point	2	9¾

In the above figures the height of the air column on the Richards pulsator classifier is not included, since this portion of the machine occupies space which would otherwise be unused. The classifying current maintains a constant agitation of the ore from the moment the ore enters the machine until it is discharged as a classified product, hence groups of particles are broken up, insuring that each class of material will be delivered from the proper spigot. In both the inverted and the direct forms the lighter finer particles are liberated from the heavier particles by the agitation, and in the inverted form the velocity of the classifying current in the first compartments is not sufficient to lift the heavier particles, while in the direct form the velocity of the classifying current in the first compartment is so great that the finer particles cannot settle against it. This thorough agitation of the ore from the moment it enters the machine until it is discharged washes the fine, free, mineral particles off the large gangue particles to which they are clinging when fed to the machine, and discharges these small mineral particles with the fine product to which they belong.

The increased ratio of equal settling grains effected by the Richards pulsator is also of great value in the economical treatment of finely crushed ores. When the ore is crushed so fine that the condition of an absolute liberation of mineral from gangue is approached, then a close relationship between the size of the grain and its mineral content is established, and a fine screen can be used as a rough concentrator. Treating copper ore wherein included grains are still found after the ore is finer than 150-mesh, the Richards pulsator classifier is fed with ore ranging from 2.5 mm. (5-mesh No. 13 wire, approximately) to zero, and the tables treating the fine product themselves produce middling and tailing still high enough in copper to make further recovery advisable. This middling and tailing are screened over a screen of very fine mesh, and the oversize is sent to waste, while only the undersize is further treated.



It is no exaggeration to say that this apparatus constitutes the most radical, important, and valuable improvement in ore-dressing appliances that have been placed on the market for many years. The Richards pulsator classifier is the first machine that will actually classify, separating the slime from coarse, in such perfection that the water discharged with the coarse material from the classifier is as clear as drinking-water. The Richards classifier is also remarkable for the small space required, and for the amount of work done, as compared with the most perfect forms of classifier heretofore known. A spitzkasten to handle 150 tons in 24 hours, would require two machines 40 ft. long by 9 ft. high by 25 ft. wide, whereas the Richards pulsator classifier, doing the same work, occupies a space only 6 ft. long by 3½ ft. high by 2 2-3 ft. wide. This machine is built by the Denver Engineering Works Co., and has been adopted, among others, by the Boston & Montana Con. Copper & Silver Mining Co., Great Falls, Mont.; The St. Joseph Lead Co., Flat River, Mo.; Tomboy Gold Mines Co., Ltd., Telluride, Colo.; Colusa-Parrot Mining & Smelting Co., Butte, Mont.; Federal Mining & Smelting Co., Wallace, Idaho; and Moctazuma Copper Co., Nacozari, Mexico.

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EDITORIAL.

A STRAW will show the way the wind blows. For the first time in many months immigration through the port of New York shows an increase.

WE ARE INFORMED that two different expeditions sent to Colombia during the past twelve months to test tracts of land stated to be suitable for dredging have obtained satisfactory results, after drilling the ground carefully and making such other tests as were needed to demonstrate the existence of a possible gold mine. The field open to dredging is going to be widely enlarged during the next five years.

RECOVERY from industrial depression must be progressing fairly well when the dividends distributed at New York on October 1 amount to over 67 million dollars, as against 79 millions last year and 78 the year before. On the same date the interest disbursements aggregated over 63 millions, as against 60 and 57 in the two years before, so that the total distribution of profits recorded amounts to $131,000,000, as against $140,000,000 on October 1, 1907, and $135,000,000 on October 1, 1906.

MINING on the Rand has revived of late, and the air of pessimism so prevalent since the Chinese were repatriated has given place to a cheerful spirit. Statistics warrant the better tone of the stock market. For the first six months of 1908 the gold produced was worth £14,442,000, as against £26,421,837 for the twelve months of 1907; during the first half of this year the dividends aggregate £4,085,719, as compared to the £6,962,020 distributed during the whole of last year. This is a notable gain. In 1908 the total yield of gold should reach £30,000,000, or about $150,000,000. This is likely to mark the high tide of gold production in South Africa.

ON OCTOBER 1 the postal rate on letters from the United States to Great Britain becomes two cents or one penny, per ounce or any fraction of an ounce. This reduction marks an important increase in the facility for correspondence between the peoples on the opposite sides of the Atlantic. Even in San Francisco, the great port of the Pacific Ocean, we now receive letters in 10 days from London, and we count upon 11 days as the regular interval. While the mail service with New Zealand and Australia is inadequate, we note with pleasure that the Australasian governments have subsidized the mail steamers running from Sydney to Vancouver and San Francisco. We hope to see the time when a similar policy can be applied liberally by the United States. The post is a great agent of civili-

zation, a factor in promoting international goodwill, and a stimulant to business between regions far apart.

NOME, and the Seward Peninsula in general, has suffered this year from lack of water, so that the output of gold during the season now coming to a close will be much less than last year. It is likely to be from $4,250,000 to $4,500,000, as compared to $7,000,000 last year, although it is well to add that the official estimate for 1907 is considered to have been a little too high. There was no rain this year until July 31, and the meteorological record confirms the statements of the observant inhabitant; thus, during the first half of 1907 the total precipitation was 10 inches, while during the equivalent six months in 1908 it was only 3.49 inches. The water derived from snow lasted to the end of the first week in June, and by the end of July many of the placer mines were compelled to cease operations. Even in the high lands, at 700 to 1000 ft. above sea-level, where the ditches have their intake, there was but little snow this spring, so that the miner became dependent on ground-water and upon rain, the one an inadequate and the other an uncertain source of supply. Nevertheless, the outlook for the Seward Peninsula is cheerful, for evidence is accumulating that there are large areas likely to become profitably productive when exploited by methods consuming less water, and they are likely to be the sources of much gold during normal seasons when a moderate quantity of water is available. Nome and its tributary districts are not worked out, nor will they be exhausted for many years to come.

IT WILL BE NOTED that our correspondent at Johannesburg records the fact that the Minister of Mines has arranged for the assay and analysis of minerals for prospectors at moderate fees. In the States of Australasia similar aid to mining exploration is rather the rule than the exception. In the Yukon the Federal Government of Canada employs an assayer, stationed at White Horse, whose duty it is to make assays gratuitously, and we were informed by him that he was frequently in receipt of samples coming from American territory and sent by persons desiring to avoid payment of fees. While opposed to such paternal government aid as may stifle initiative or compete unfairly with the practice of professional men, we are constrained to admit that in new countries there is good reason for the establishment of Government assay-offices. In California and Nevada, for instance, we need no such help, but in a sparsely populated region where there is not enough assay business to justify low charges for testing samples, it is conceivable that many discoveries of mineral are either not made at all or postponed for lack of proper investigation. In Alaska, for example, there occur deposits of many minerals unfamiliar to the average gold prospector, not to mention the quartz veins that are tested by the pan only. It is not realized by the placer miner that there are many deposits containing gold that yield but scant evidence of richness by mere washing of a grab sample, and this fact is today hindering the exploration of the North. Insufficient sampling and assaying have retarded the development of many mines and many mining regions.

Drills and Drill-Steel.

IN OUR ISSUE of September 19 we published a valuable contribution on drill-steel by Mr. Eugene P. Kennedy, the assistant-superintendent of the Alaska-Treadwell mine. Such transcripts from actual experience are always appreciated by the readers of this journal, no less than they are welcomed by the editors. A recent visit to the great mine on Douglas island prompts us to refer to the use of cruciform steel, with a view to emphasizing the value of Mr. Kennedy's observations. It was an experiment with the Waugh drill, which uses all kinds of chuck-bushings, that suggested the idea of using cruciform steel in the standard piston-drill. The operator of the Waugh drill used 1⅛-inch steel in a square chuck, or 1¼ and 1-inch steel in a cruciform chuck. He claimed that the steel provided was too heavy for his machine and, in order to make the test satisfactory, it was arranged to insert 1-inch steel into a cruciform chuck. This incident will amuse those who know how difficult it is to make reliable drill-tests; usually there are prejudices on both sides: the foreman of the mine is likely to be opposed to any change, and the agent of the new machine is apt to ask for ideal conditions, such as will spoil the experiment.

In the Alaska-Treadwell mine it has been the custom to employ Ingersoll-Sergeant drills of 3¼ and 3⅝ in. (for sinking) piston-diameter. From time to time other drills have been tried; thus, the smaller 2¼-in. piston-drill of the same make has been employed for cutting-out stopes and drifts, and it is undoubtedly an economical machine when properly used. The trouble is that the men fight the introduction of the smaller stope-drill, for it means harder work. In running the larger machine, two men are required to set the drill in place, and once the drill is started there is not much to do but crank the machine; in consequence, any difficulty that arises is shared by the two men. With the machine that needs the service of one man only, the single operator has to erect the drill, start the hole, throw in water, change the steel, and keep his machine in alignment, all by mimself. Therefore it is not unusual for the men to hammer the drill, break the bolts, and generally give the objectionable machine as poor a chance as possible, in the hope of proving it less serviceable than the two-man drill. On the other hand, in a mine that is well managed the chuck-tender on the big drill can be kept busy in fetching steel when the machine is running, while with the one-man drill work stops entirely when the driller absents himself. It becomes desirable to have a gang of 'nippers', say, one for every five stope-drills. A car running on an inclined track in the man-way could be used for lowering steel, so that the helpers would have to go only 100 to 150 feet, at most. Even if two men do not seem required when all goes well, it is found in

practice that whenever the drill is 'binding' or running badly the two men are needed to adjust the machine, one moving it, while the other loosens or tightens the bolts.

The Treadwell experiment proved that the Waugh hammer-drill was well adapted for special purposes, although not strong enough for the work of the big stopes where the footage was only one-half that made by the larger piston-drill. At Goldfield, we saw the same drill in the Florence mine under conditions much more favorable to competition with the piston-drill. Each has its scope. For making holes for plugs intended to hold electric lights, for survey and roller holes, for pillar plugs, and the like, the Waugh will prove useful even in the Alaska-Treadwell mine. For breaking chunks of ore in a choked chute, the Waugh is serviceable; but ordinarily the delay in getting an air-pipe connection renders 'bulldozing' (the placing of dynamite on the rock without drilling any hole) more expeditious. In matters of this kind academic instructions are useless. The intelligent observation of the foreman must supplement the technical training of the superintendent. Thus, the use of cruciform steel came by orderly development. Originally, the chuck-bushings were round and the octagonal steel had to be rounded to fit; then the bushing was changed to an octagonal shape, avoiding the rounding of the shank of the drill. Later, a cruciform bit was used, and at first 14 inches of cruciform steel was welded onto an octagonal shank such as would fit the chuck-bushing. To avoid the expense of welding and to make a better tool (for the swell at the weld is bad in dry holes), it became desirable to employ drill-steel and chuck-bushing both of which were cruciform. Two machines were tried for five months before the alteration was made general throughout the mine, as related by Mr. Kennedy in his valuable article. We shall be glad to hear from other superintendents in regard to this subject.

Politics and Business.

A MINING ENGINEER resident at Tokio writes asking us how the coming election will influence business in the United States. Another reader at Melbourne wants to know if the reform movement in America is making any progress. Both of our enquirers take it for granted, as they are fully warranted, that this journal is not involved in political controversy, and is therefore able to describe the situation without prejudice. Surely it is a most interesting period in American history. The assassin who ended the life of William McKinley was the unwitting instrument whereby Theodore Roosevelt was promoted to the presidency, after his enemies had supposed him safely shelved in the decorative office of vice-president. McKinley's second term had barely begun, so Mr. Roosevelt served for nearly four years before he went to the people for election to succeed himself. In that campaign of 1904 he did not run against Mr. Bryan, but against a man so little known as to prove a weak competitor. His triumph was complete. By his fearless insistence on a high standard of public duty, by his extraordinary energy, by a mingling of impulsive frankness and clever policy, by a breezy manner and a cheerful optimism, by his evident honesty of purpose, he caught the fancy of the people, for in him were personified the qualities that are distinctively American. During the last four years he has become the effective spokesman for the party of reform, incurring thereby the resentment of many of the leaders in his own party and arousing the animosity of the group of rapacious financiers into whose hands the control of business and politics was surely drifting. Having given his word not to try for re-election in 1908, he made it his affair to see that his successor should continue his policy, and to that end he chose William H. Taft, an able administrator, who had been Federal judge, Governor of the Philippine Islands, Secretary of War, and in these and other offices had proved himself to possess both unusual capacity as an executive and a high ideal of conduct. When the Republican convention met to select a candidate there never was any doubt as to the outcome, for Mr. Roosevelt's leadership was unquestioned, and his recommendation of Mr. Taft proved more than enough to ensure nomination. It was said by the Democrats and others that the President dictated the doings of the Republican convention; it was a fact that he had so firm a hold on the imagination and affection of the rank and file of his party that there was every wish to select a man likely to follow in his footsteps. So much for that side. On the other stands William J. Bryan. Twelve years ago he won the nomination as candidate for President by reason of a florid oration that stampeded a Democratic convention. He was defeated by McKinley in 1896, and again in 1900. In 1904 his own party chose another standard-bearer. This year there was no doubt as to his nomination, for no other Democrat had equal claim to leadership and the convention that selected him was so enthusiastic in his support as to make the outcome certain. It speaks well for representative government that the two candidates before the American people at this time are such as would be chosen by a plebiscite. For Bryan is a logical candidate, no less than Taft. First a country lawyer, then a clever speaker, without experience of public service save as congressman for one term, then an editor, but continually before the public as an effective and persuasive orator, he has gradually gained experience as a politician and won the affection of a large portion of the people as a sincere reformer. His private life has been blameless; his public record has been clean. An unprejudiced judgment will allow that he is an honorable radical. One great function he has served: he has been the safety valve for popular unrest. In the days before Roosevelt led the party of reform, when the business interests identified with the tariff and the trusts were the pets of the Republican party, when such politicians as Platt and Depew, Aldrich and Grosvenor, were in the ascendant, Bryan was the spokesman for those to whom a corrupt plutocracy seemed a hateful outcome of this great experiment in representative government. So we dare to say to our friends in Tokio

and Melbourne that the United States is fortunate no less in Bryan than in Roosevelt. Save for them we should have had to choose between socialism and an oligarchy of industrial pirates. It is our deliberate opinion that if McKinley had lived out his second term, and had been succeeded by some other one of the group of men so closely allied to the great corporations that controlled the railroads and manufactures of this country, we should have seen a practical end to popular government in America. If the reform movement had not made headway, by reason, in part at least, of the oratory of Bryan and the virility of Roosevelt, we should have seen wealth accumulate so fast, by turning water into golden wine on Wall Street, that twenty men within ten years would have possessed $100,000,000 apiece, and would have used their financial power successfully to debauch the cheap legislators at Washington and at the various State capitals. Legitimate business has nothing to fear from the outcome of this election; Taft is a man of rare sanity and good humor; Bryan is no firebrand, he is as honest and patriotic as any man that ever lived in the White House. Taft plays golf; Bryan plays at farming. The American people is attending to business affairs, relaxing its attention only when something spectacular happens. Therein lies a danger. Attention to the duties of citizenship is confined largely to those to whom politics means business; the 'pocket nerve' responds more readily than the intelligent understanding. Movements of reform appeal to the dissatisfied and disgruntled, the number of whom varies directly as the sum of general prosperity; on the other hand, any effort to cure abuses meets with the organized opposition of those among the rich and powerful to whom reform means interference with facilities for making money rapidly. The United States needs more men willing to devote their time and money to the public service, to check the power of those to whom politics is either a species of blackmail or subsidized legislation. The young men of the country have been stimulated to a higher sense of patriotism by such fearless devotion to duty as that exhibited by the President, by the present Governor of New York, and, it is fair to add, by Mr. Bryan, who has spent his life in the advocacy of reform. At present the prosperity of the country, even after a panic, is inimical to violent reform; manufacturers are unwilling to see any tinkering with the tariff and will support the party in power; the realization that the tariff is the incubator of trusts will not influence many voters to take the opposite side. Whether Bryan or Taft be elected, the next Congress will be Republican, and there is no probability of any violent change in the protective policy of the United States. For the rest, the pre-occupation of the people and the revival of business activity following upon the presidential election, will tend to throw the brake upon the wheels of legislative change. In the meantime thoughtful men of other progressive countries may well give thanks; we have escaped the danger of having a reactionary in the President's chair, for a Cannon or a Fairbanks, a Foraker or a Bailey, would have given fierce vigor to the uncertain steps of socialism and would have checked severely the progress of representative government in every civilized country.

Wash Sales.

IN CONSEQUENCE of an investigation made by the Board of Governors of the New York Stock Exchange, the two members of a bankrupt brokerage firm were expelled because their conduct was held to be "inconsistent with just and equitable principles of trade." On August 22 they had recklessly committed themselves on the short side of the market for securities aggregating more than 538,000 shares, and on the same date, to take advantage of the demoralization expected to result from their raid, they had distributed orders for the purchase of securities totaling not less than 750,000 shares. At this time their entire available financial resources were insufficient to cover an advance of 1 per cent in the price of the securities of which they were short. They involved themselves toward their fellow-members of the Exchange in commitments vastly in excess of their ability. They failed in their game, and their failure injured many innocent persons. In defense they claimed that there was no rule establishing any proportion of capital necessary for members to transact business. The committee appointed to investigate was urged to make a public statement concerning the whole subject of fictitious trading. But the majority was opposed to the idea, the argument being that the time was inopportune and discussion of the question might lead to exploitation in the presidential election. It is high time that the Governors of the Exchange took action to stop 'wash sales', 'matched orders', and all the other methods by which spurious speculative activity is manufactured by adventurers. It is well known that the business of Wall Street is largely augmented by bogus dealings intended to inveigle the simple-minded that linger on the outskirts of that exciting hippodrome. In dull times it is necessary to go through the motions of buying and selling 500,000 shares in order to get one real purchaser of 100 shares. And it is not only the small brokers that play this confidence game. The big financiers manipulate the market with a freedom as great as their resources warrant, and find it easy to regulate the speculative barometer as they wish, except on occasions when unexpected events upset a shrewd program. Too much of the brain energy of the country is devoted to this betting on stocks, too many dynamic men give their lives to it, too much money is tied up in an unproductive industry. If the hundreds, even thousands, of clever men now playing with stocks were withdrawn from the Monte Carlo of Wall Street and were to devote abilities of a high order to productive industry—to farming, to mining, to constructive labor—the country would be enriched greatly. Not many would be needed to register the bona fide sale of securities. The community might then hope to be less obsessed by the spectacle of wealth accumulated by chicanery, and the life of the people would be less involved in the feverish antics of those that gamble.

Personal.

ROBERT M. RAYMOND is here.

W. H. SODERBERG is at Nome, Alaska.

F. L. MORRIS has returned from Idaho.

LEWIS T. WRIGHT has gone to New York.

ROSS E. BROWNE is in the Coeur d'Alene.

ERNST DENICKE has gone to Chihuahua, Mexico.

H. E. WEST is at Fredericton, New Brunswick, Canada.

J. H. CURLE has returned to London, from South America.

C. M. FUELLER, of Denver, is on his way to San Francisco.

W. S. NOYES has returned to San Francisco, from Arizona.

JAMES W. NEILL has returned to Pasadena, from Salt Lake.

EDMUND JUESSEN is expected here, on his way to Blair, Nevada.

J. BOYD AARONS is on his way from London to Western Australia.

LIONEL LINDSAY has returned from a tour in Spain. He is at Denver.

W. H. LANAGAN is with the Wild Goose Mining & Trading Co., at Nome.

HENRY BRATNOBER has returned to Tacoma from southeastern Alaska.

N. SAMWELL is testing dredging ground in the Salveen district, in Burma.

W. B. BRETHERTON is chemist at the Balaklala smelter, in Shasta county, California.

JAMES F. KEMP has returned to New York, from journeys in Mexico and the Southwest.

FRANK M. WOOD is superintendent of the Three Friends dredge, near Solomon, Alaska.

ISIDORE TOM is with the Associated Gold Mines company, at Kalgoorlie, Western Australia.

GELASIO CAETANI has returned from Europe. He will be in San Francisco until October 10.

HENRY F. LEFEVRE passed through Butte, on his way to the Georgetown district, in Montana.

GEORGE S. BINCKLEY has returned to Los Angeles from a professional journey to British Columbia.

R. D. HUNTER, manager of the Northern Light Mining Co., has returned to Oakland, from Nome, Alaska.

GILBERT H. RUSSELL is superintendent for the Blue Goose Dredging Co., on Ophir creek, near Council, Alaska.

T. LANE CARTER, manager of the French Rand mine, Johannesburg, is visiting the gold mines of the United States.

C. T. DURELL has left the Philippine Islands for Denver, Colorado, by way of the Strait Settlements, India, and Europe.

M. A. NEWMAN, manager of Cia. Minera Jesus Maria y Anexas, of San José de Gracia, Sinaloa, Mexico, is in San Francisco.

F. LYNWOOD GARRISON has reached Philadelphia, from Colombia, where he inspected an important tract of dredging ground.

WILLIAM S. WEST is superintendent of the Wild Goose company's operations on Ophir creek, in the Council district, Alaska.

WALTER W. WISHON is moving to Austin, Nevada, to take charge of a large consolidation of old mines, known as the Austin-Manhattan.

JOHNSON & ENOS have moved their offices from the Iturbide hotel to the Quirk Bdg., corner of San Francisco and Gante St., Mexico City.

DAVID GOODALE has resigned as manager for the Campañia Minera Rio Tinto Mexicano, in Chihuahua, and will reside at Berkeley, California.

Latest Market Reports.

LOCAL METAL PRICES—October 1.

Antimony	12@16c	Quicksilver (flask)	$43@44
Casting Copper (scrap)	8½@13½c	Spelter	6½@7¼c
Pig Lead	4.85@5.80c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept. 24. £. s. d.	Oct. 1. £. s. d.
Camp Bird	0 13 0	0 13 3
El Oro	1 7 0	1 6 3
Esperanza	3 4 0	3 8 9
Dolores	1 10 0	1 10 0
Oroville Dredging	0 12 0	0 11 6
Stratton's Independence	0 1 0	0 1 0
Tomboy	1 2 6	1 2 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Sept. 25	13.31	4.49	4.78	51⅝
" 26	13.31	4.49	4.78	51½
" 27	Sunday.	No market.		
" 28	13.31	4.49	4.78	51⅝
" 29	13.31	4.48	4.78	51¾
" 30	13.31	4.48	4.78	51¾
Oct. 1	13.31	4.48	4.78	51⅝

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Sept. 24.	Oct. 1
Amalgamated Copper	74	74½
American Smelting & Refining Co.	85⅛	84⅝
Boston Copper	13	13⅝
Butte Coalition	24	24
Cumberland Ely	7⅝	7½
Dolores	6¼	6½
El Rayo	3¼	3¼
Giroux	4⅛	4⅛
Greene-Cananea	10⅛	10⅜
Indiana Sonora	5	4¾
La Rose	6⅜	6½
Miami Copper	10	10¼
Nevada Consolidated	15⅛	15½
Newhouse	5¼	5⅝
Nipissing	8½	8½
Ohio Copper	2¾	3
Tennessee Copper	38⅜	41
Utah Copper	41	41⅝
Yukon	4¾	4½

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, October 1.

Atlanta	$ 23	Laguna	$ 1.15
Belmont	1.22½	MacNamara	56
Booth	43	Manhattan Con	6
Columbia Mtn	25	Midway	29
Combination Fraction	1.27½	Montana Tonopah	90
Daisy	73	Nevada Hills	1.10
Fairview Eagle	35	Rawhide Queen	65
Florence	3.30	Sandstorm	25
Gold Bar (Bullfrog)	3	Silver Pick	18
Goldfield Con	5.65	St. Ives	27
Gold Kewenas	33	Tonopah Extension	60
Great Bend	31	Tonopah of Nevada	7.50
Jim Butler	24	Tramp Con	16
Jumbo Extension	36	West End	53

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. October 1.		Closing prices. October 1.
Adventure	8	Mohawk	60
Ahmeek	100	Nevada Con	15½
Allouez	35	North Butte	81⅜
Amalgamated	74¾	Old Dominion	41½
Arcadian	3½	Osceola	107
Atlantic	17½	Parrot	25½
Bingham Con	35	Phœnix	55
Boston Con	——	Quincy	90
Butte Coalition	24⅛	Rhode Island	4
Calumet & Arizona	114	Santa Fe	1¾
Calumet & Hecla	640	Shannon	14½
Centennial	32½	Superior & Pittsburg	13½
Copper Range	73½	Tamarack	70
Daly-West	——	Trinity	10
Franklin	12¼	United Copper Con	11¼
Granby	98	Utah Copper	43
Greene-Cananea, ctf	10¼	Victoria	4¼
Isle Royale	22½	Winona	5½
Mass	5¾	Wolverine	——

General Mining News.

ARIZONA.

GILA COUNTY.

The Gibson Copper Co. reports a more favorable showing on fifth and sixth levels of its mine, where the crosscuts are in low-grade sulphide, and indicate the width of the vein to be over 100 ft. It will probably require two months more of development work on the lower levels to open the rich ore-shoots which were found on the third and fourth levels. Shipments of high-grade ore from the Gibson are continued at the rate of about 12 tons per day. ——In preparation for deep mining, the Arizona Commercial Co. is installing three large pumps in the Eureka shaft, and when ready to operate, sinking will be resumed. The present intention of the management is to go down 250 ft. and open levels 125 ft. apart. Later the Eureka shaft will be sunk to 1000 feet.

MARICOPA COUNTY.

It is reported that the Rogers Springs Co. will build a smelter to handle the product of its own mines and to do custom work. The smelter will be built in 100-ton units. Douglas and El Paso being the nearest smelters, it would seem that a plant at Cave Creek would give a great impetus to mining in that district. Shipments now involve a 36-mile wagon haul to Phoenix.——The Black Rock is preparing to sink its shaft to the 600-ft. level and may install electric power to replace the three gasoline engines now in use.

MOHAVE COUNTY.

J. A. Elway, of Philadelphia, has purchased the Gold Bar mine at Cerbat from T. R. Garnier, and will at once sink a shaft and explore the ground, from which some rich ore was worked from the surface.——The McCracken Hill Mines Co. has stopped work on its property and it is believed that the bond and lease will be forfeited.——The Gold Road M. & E. Co. is planning the installation of electric machinery to replace the existing plant. The mill will also be changed from rolls and Huntington mills to a stamp-mill.——Garnier & Stirzel will start work soon on the St. Louis mine, at Cerbat. It is their intention to advance the lower drift to strike the Man vein.

YUMA COUNTY.

The Crown Copper Co. will start work soon in deepening its shaft and extending the 300-ft. adit. Ample funds are said to be in hand for continued working. The ore is ideal from a smelting standpoint and carries 20% copper. The property is 26 miles northwest of Wenden.—— The Imperial Placer Co. located 26 claims extending from Pot Hole to Pioche, and will immediately resume operations.

CALIFORNIA.

ELDORADO COUNTY.

The Woodside Eureka Mining Co. has completed the work of sampling the vein in the recently unwatered Eureka shaft and are now building an engine and boiler house. The Woodside shaft, a thousand feet south of the Eureka, may be unwatered, at least a number of people in Georgetown are anxious to invest in such an undertaking. ——On the Jumbo group of mines the Connors' adit is being re-opened and will be run ahead about 200 ft., from where a raise of 100 ft. will connect with the shaft on the Silver Pick ground, sunk by the Kockel Bros. in 1902-3, from which considerable specimen rock was taken. Everson, Kinch, and Jerrett, of Georgetown, are the owners of the group, and R. W. Kinch will have charge of the work.

INYO COUNTY.

The Bishop Creek Gold Co. reports that the drift being driven from the 160-ft. level of its new shaft has cut an orebody which assays about $170 per ton in gold. The drift is in only 15 ft. The shaft passed through good ore nearly all the way down, and prospects for a producer seem to be bright.——The accidental discovery of bonanza gold ore near Silver Lake at the head of Rush creek, about 30 miles from Bodie, last week, has started a stampede into that district. Over 300 people are already on the ground and others are arriving daily. Stores and saloons are going up and business is flourishing in the new camp.

MARIPOSA COUNTY.

The Saxon Creek mines, 12 miles above Bagby on a branch of the Merced river, have been sold to Charles Morrell, who recently bought the Egenhoff. The consideration was $18,000, and the contract calls for starting development work within 10 days. A stamp-mill will be built.——The old Ferguson mine has been bought by a company which will resume work in October. This mine is on the same belt as the famous Hite Cove, being three miles northwest of the latter. It has been a great producer. Power for its operation will be taken from Merced river.

NEVADA COUNTY.

(Special Correspondence).—Manager Scarfe of the South Yuba Water Co. has officially notified the various mine managers in the Grass Valley and Nevada City districts that after October 1 only one-half of the usual supply of water will be furnished. The continued dry spell has made serious inroads on the water reserve and there is no prospect of an early relief. As a result several of the mines will be practically compelled to suspend operations, while others will operate on a greatly reduced scale.—— The Woodberry mine has been bonded to a company of local men and will be worked on a comprehensive scale. A hoist and pump will be immediately installed and the shaft sunk to considerable depth.——The Santa Barbara company which recently bonded the Norambagua mine has made the first payment of $5000 on the bond. Foundations for the hoist, compressor, and other machinery are nearing completion.——A drift has been driven from the new shaft at the Alaska and has tapped the old shaft at the 300-ft. level. As soon as the shaft is drained active developments will be commenced. George St. John is superintendent.——An agreement has been effected between the Tarr Mining Co. and the New York-Grass Valley Co. whereby the latter will receive sufficient water to operate its machinery. One of the pumps is working, but the larger pump at the 100-ft. level is under water and refuses to work.——Ground is being broken at the Canada Hill mine for a five-stamp mill. Later on five more stamps will be installed. A large quantity of ore has been opened up. A. Charonnat is superintendent.——The Golden Crown mine will shortly resume work. Two stamps will be placed in commission.——A. M. Gilbert, of Santa Barbara, has bonded the Deadwood mine in Willow valley. Work will start at once.——San Francisco mining men are inspecting the Morning Star mine with a view to its re-opening.

Grass Valley, September 28.

SHASTA COUNTY.

The owners of the Golinsky mines, on Little Backbone creek, have let a contract to Charles Hartman for considerable development work and a force of 12 men will start work at once. The ore carries copper and some little gold.——A force of 25 men is to be put on at the Shasta King mine early in October. Arrangements have already been made for the opening of the boarding house. Morgan Thomas will continue as superintendent at the mine.——Work is about to be commenced on the actual construction of the Niagara mill, at French gulch. The timber has been on the ground for some time. The contract for its construction was let the past week to Whitlock & Love, the Kennett contractors. It will be a ten-stamp mill.——O. W. Maulsby, of Los Angeles, has taken a bond on the Copper Crest mine, near the Mammoth, owned by I. O. Jillson. Mr. Maulsby is extensively interested in operation of mines in Mexico and expects to give the Copper Crest a thorough development.

TUOLUMNE COUNTY.

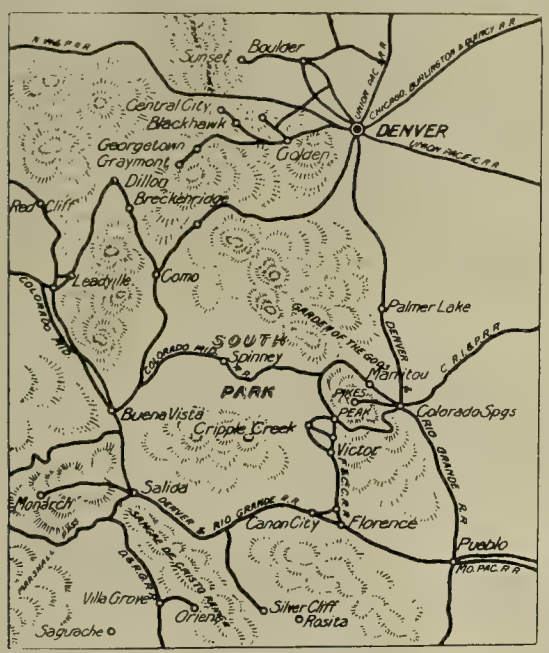
The Laura and North Star mines have been bonded to W. G. Phipps with an option to purchase within a year

at $29,000. The bond requires the payment of a 20% royalty to the owners.——The Big Creek Mining Co. has sold all its property in the county, consisting of the Golden Rock ditch and water rights, placer and quartz mines, and large quantities of timber land, to the Tuolumne River Power Co., composed of Eastern capitalists. Charles D. Shaw is president and L. R. Wiley, who was manager of the Big Creek company, has been made manager of the new concern.——It is reported that operations will be resumed on the Starr King, in the east belt, and that a 10-stamp mill will be built.——The two-compartment shaft in the Ralph, controlled by the Bagdad-Chase Co., has reached a depth of 120 ft. A 40-stamp mill is one of the future additions planned for this property.——The Jumper has closed down on account of a shortage of water and operations will not be resumed until electric power is available. Development work still continues.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—A compressor plant has been ordered by the Ramsdell G. M. & M. Co., operating the Ramsdell group of seven claims on Lincoln Mtn. The



A Part of Colorado.

mill, which was partly constructed last fall, is to be completed without delay. This Company was recently reorganized, the bond of $10,000 having been lifted about six weeks ago. Funds have now been provided for continued development. The Market adit is to be advanced for the intersecting of the series of veins owned. The bore is in 325 ft., and the Golden Jack vein will be reached within 40 ft. Driving is to be started upon the east and west drifts of the Ramsdell vein. This mill is to be equipped for both concentration and amalgamation. G. W. Teagarden has been re-appointed manager.——Work was resumed this week at the Culley adit, after a temporary close-down of two weeks. Driving was started on the Pineo vein cut 810 ft. from the portal of the adit. Within a few days work of advancing the adit will be put under way. The first known vein to be reached is the extension of the Jo Reynolds. A. L. Carr has been appointed resident superintendent.——A company is now in process of organization for the development of the Bonham group of claims, on McClellan Mtn. B. O. Bonham, the owner, has interested a number of Philadelphia capitalists in the enterprise, and it is announced that work will be put under way within 30 days.——Extensive development has been started at the holdings of the Golden Glory T. M. Co., on Saxon Mtn. A plant of machinery has been ordered and the equipment is expected to arrive in two weeks. The preliminary work, such as reducing the grade of the adit, as well as re-timbering the same, has been completed. It is purposed to drive the adit for a distance of 10,000 ft. to intersect all veins lying along its course. The first vein is an extension of the American Sisters, and it will be reached within 150 ft. Enlarged work will also follow at the Drummond mine, operated by the same Company. The adit, now in 250 ft., is to be advanced, as a streak of $44 silver-lead ore is exposed on the hanging wall that is from 8 to 10 in. wide. The winze put down to a depth of 70 ft. is to be deepened, as the orebody in the bottom is 14 in. wide. This enterprise is being financed by Texas capitalists, and A. A. Hayden, of Denver, is manager.——Announcement has been made that extensive development will soon be started at the Honest John holdings, on Chicago Mtn. The adit is now in 2150 ft. and within 100 ft. the Marysville vein will be intersected. H. G. Fowler, of Denver, is manager.——The Kalamazoo adit on Republican Mtn. is being driven steadily forward. The work is somewhat slow owing to the fact that it becomes necessary to timber on account of the looseness of the rock. This adit is being driven for the express purpose of cutting the Snowdrift vein, which has the distinction of having produced the highest-grade ore ever mined in the Georgetown district. The vein will be intersected at an increased depth of 300 ft. under the present deepest workings of the mine, opening for exploitation a vast area of virgin territory.——Many of the operators and lessees have been holding their ore awaiting an advance in the price of silver. M. J. Riley, leasing on the Sunburst, was the first to start shipments, and is now keeping a jack-train busy in bringing down a 100-ton lot of 200 oz. silver-lead ore.——H. C. Newton has assigned his bond on the Mollie Bawn and Bluebeard properties to C. F. Shaffer, of Denver, and it is understood that the full amount of $7000 will be paid during October. A company is now being organized and active development has been started. It is proposed to erect a 25-ton concentrating plant for the treatment of the low-grade ore that is exposed throughout the workings.——A new strike was made a few days ago in the Capital mines. In carrying a raise in the west drift of the Aetna vein a 3-ft. body of gold-copper-lead ore has been uncovered. Tests show the material to be worth 2 oz. gold, 7 oz. silver, 20% lead, and 8% copper per ton.——A night shift has been put on at the Pelican mill being operated by the Burleigh M. & L. Co. A hoist has just been put in for lifting the ore, that is being mined through the Burleigh adit, to the mill-bins.

Georgetown, September 26.

GILPIN COUNTY.

Hughes & Threewit have started up the Hughes mine, on Bellevue Mtn., under a lease and bond and have purchased a complete plant of machinery. The main shaft is down 100 ft. and the lessees have also given a contract to Thompson & Hambly, of Central City, for the erection of a shaft building, work on which is to be commenced as soon as the lumber is delivered. Some excellent ores, both of the free-milling and smelting kinds, have been taken out of the mine since its discovery.——Arrangements are being made for the extension of the lines of the Gilpin Tramway Co. to the Anchor mine of the Hearne Gold & Copper Co., in Willis gulch, and it is expected that grading work will be commenced within the next two weeks. When the tramway line is in it will permit of the ores being hauled much cheaper and it is expected that the daily product will soon reach 50 tons, as recent developments have opened good ore reserves.——A small force of men was put to work on the Russell mine near the head of Graham gulch, in the Russell district, during the past week and Mark Harris is in charge of the operations. The Russell ores are mostly of the concentrating and smelting kind and it is expected that shipments will soon be commenced.——Denver and Eastern people are in-

terested in the Hampton Consolidated Mines Co., owning the Hampton group of mines in lower Russell gulch, and it is understood that money has been raised for the thorough development of the property, including the installation of a large plant of electrical machinery and the erection of larger buildings. The Hampton is known as a regular producer of enargite ores, carrying a heavy percentage of copper, the first-class ores carrying $50 per ton, while the second-class ores range from $20 to $30 per ton.

TELLER COUNTY.

The Carbonate Queen, on the west slope of Battle Mtn., at Cripple Creek, has again resumed shipments. The Big Four Leasing Co., which has a lease on the property, has recently completed a pipe-line from the Ajax and is now using power drills in breaking the ore.——Moore & Seeley, who have a lease on the Lucky Gus, of the Stratton estate, have received returns of 16 oz. gold on a shipment recently made from a 4-ft. vein at a depth of 400 ft. Shipments are being made at the rate of about four cars per week. ——Gus Arnold, secretary of the Mine Owners' Association, has secured a sub-lease on the C. O. D. property, at the head of Poverty gulch, and is now engaged in prospecting. ——The Columbia Mining & Development Co., operating on the Chickenhawk of the Katinka company, on the north slope of Guyot hill, are loading out 16 cars per month of a grade of ore returning from 1 to 1½ oz. gold per ton. The Company is breaking the ore from the 500-ft. level where a vein four feet between walls is exposed. A considerable amount of development work is also in progress.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The feature of the week in the Coeur d'Alene has been still another increase in the dividend paid by the Hecla mine, at Burke. A dividend of three cents per share has been announced, being the 63rd declared by the company, and amounts to $30,000. To date the company has disbursed a grand total of $1,640,000, of which $120,000 has been paid this year.——A strike of seven feet of good milling ore has been made in the adit of the True Fissure Mining Co.'s property in the De Borgia district. The property has been under development for the past 16 years, and the strike is said to have put it on an excellent basis.——Everything is now practically in readiness for the installation of the big hoist at the property of the Great Western Mining Co., in the Burke district. The last work on the new hoist will be finished within the next day or so, and the Company will commence to sink on the orebody. It is the intention to sink a winze 200 ft. deep, although it is believed good ore will be found within the first 100 ft. ——The annual meeting of the stockholders of the Temple Mining Co. was held last week, and the following officers were elected for the ensuing year: president, John Stambaugh; vice-president and manager, David Gross; secretary-treasurer, A. H. Featherstone; directors, C. R. Mowery, Herman J. Rossi, Bonnell Michiavelli, and C. F. O. Merriam. The directors decided to continue driving and to keep up development all winter.——The property of the Acme Mining Co., in the Kettle Falls district, is reported to have been bonded to the British Columbia Copper Co. for $50,000. The terms of the bond provide that the property is to be extensively developed. A considerable amount of work has already been done and a good showing made, but for some time past the property has been practically idle.——Still another strike has been made on the property of the Black Horse Mining Co., in the Murray district. Like the former strike, the new one consists of between four and five feet of good milling ore. During the winter or early in the spring the Company will spend more than $100,000 on the erection of a concentrator and the installation of every form of machinery that will aid economical mining. As soon as the new railroad reaches the mine, shipments will be commenced.——It is expected that in a few months shipments will be resumed from the property of the Keystone Mining Co., from which more than $200,000 worth of ore has already been taken. The adit is progressing at the rate of 2½ ft. per day, and there is still about 200 ft. to go before reaching the orebody. The present adit will give a depth of about 300 ft., and if this comes anywhere near the expectations of the Company, the mine will join the shipping list again almost immediately.——A report of the past 18 months' work on the property of the Trans-Continental Mining Co. has recently been issued to the stockholders. This report deals at length with the development of the mine, and is extremely favorable.——A force of men has been put to work on the property of the Evolution Mining Co., and it is reported that a number of shipments are about to be made from the property. This ore will be sent to the new smelter at Pend d'Oreille.——A splendid strike of ore is said to have been made in the property of the Montana Standard Mining Co., and while no details are yet to hand, it appears that this consists of 18 in. of clean shipping ore and several feet of milling ore.——Another contract is about to be let on the property of the North Franklin Mining Co., a contract for 200 ft. of work having just been completed. The showing in the adit for the last 50 ft. is said to have been most encouraging; several stringers of ore have been cut and it is expected that the vein will be opened within a comparatively short distance.——A company composed of Wallace men has been formed for the purpose of taking over the Liquidator group of claims adjoining the Hecla mine, at Burke. The group consists of 13 claims, and has already been developed and a fair showing made. The new company is capitalized at $1,000,000.——Work has been commenced by the Tekoa Mining & Milling Co. on the Plumbi group of claims, at the head of Dudley, Grouse, and Two Mile creeks. A contract has been let for 100 ft. of work, and after a short upper adit has been driven it is the intention of the Company to drive a long adit. Work will be carried on all winter and an equipment of machinery will probably be installed in the spring.

Wallace, September 26.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—The Herald Mining Co. has started its plant after a shut-down of several weeks, during which time a considerable amount of repair and development work was accomplished. The incline shaft has been completed to more than 400 ft., penetrating the whole ore deposit. The plant was started last week and a turn-in has been made.——A three-compartment shaft is being sunk by A. O. Ihlseng, on the Ping & Robertson lands, north of Galena. The shaft will open up the orebody found between 225 and 300 ft. A 250-ton plant will be built later.——The Chicago-Quapaw and the Good Luck mills are rapidly nearing completion, in the Baxter Springs camp, and will be ready for operation within a fortnight. Work on the Lucile mill is also being pushed as rapidly as possible. Arrangements are being made by the Heap O'Brien Co. to build a mill on its lease. The Indiana mill has been bought by the Consolidated Mining Co., of Miami, and is being moved to its lease on the land of the Baxter Royalty Co. near the Golden Hen.

Galena, September 19.

MISSOURI.

LAWRENCE COUNTY.

(Special Correspondence).—The output from the Aurora camp for last week was the largest of the year and the situation is encouraging. A large amount of prospect work is being done and good strikes are constantly reported. Three miles southwest of the city, a silicate strike was made on the Feaster land at 26 ft. A few drill holes put down there several years ago showed ore, but no further development was done until recently. A four-foot face has been opened, with ore still in the bottom of the shaft. ——Snavely & Co. have leased the Wheat and the Smith farms, southeast of the city, and will develop the land at once. Ore has already been struck, but further drilling will be done by Jim Moore. Ore has been found at 254 ft. with the drill still in ore when the work was abandoned. All the holes will be sunk to 300 ft. to strike the lower levels known to exist.——Grant Seburn struck a good run

of zinc-blende in a drill hole between the Sphalerite and the Cleveland-Aurora tracts. The ore was found at 35 ft., continuing for 32 ft.——South of Sarcoxie, on the Miller farm, ore was found from 57 to 75 ft. Practically the same find was made on the Wasson farm, two miles northeast of Ritchie. Across Shoal creek ore is being taken out at 25 ft. Outcroppings have been noted on the Connelly farm south of Ritchie. These strikes seem to indicate that a continuous vein extends between Sarcoxie and Ritchie.

Aurora, September 19.

NEVADA.

ESMERALDA COUNTY.

John LeFoe has secured a lease on the Gold Coin claim of the Jumbo Extension Mining Co., near Diamondfield. He had formerly a leasehold on the same block.——It is definitely stated that Nixon and Wingfield have secured control of the Combination Fraction, but that it is for their personal account and not for the Goldfield Con. Mines Co. The controlling interest comes through the purchase of the T. D. Murphy block of stock.——The Florence Consolidated Mining & Leasing Co. is steadily increasing its daily output of high-grade ore, and from present indications, will establish a record production before the expiration of the lease. The Company is shipping nearly 75 tons per day which will average more than $80 per ton. A large electric hoist will be installed within a few days, as well as an air-compressor, and as soon as the power drills are working, the output will be considerably increased. A cross-cut is now being driven to connect with the workings of the Baby Florence, and should be through within a week. This will insure better ventilation and enable the Company to make even greater headway.——The Nichols property, near Queen's station, is the scene of a new strike that is arousing interest in this old district. The Queen Canyon Mining & Milling Co., whose property adjoins the Nichols ground, is preparing to add several stamps to its mill and also install a cyanide plant.——Re-organization of the Florence Gem was completed last week and the Company is now known as Florence Annex No. 2. The following new directors have been chosen: J. R. Woodbridge, T. H. Tighe, Charles A. Jones, Alfred Held, and Dix W. Smith. The basis of the re-organization was 600,000 shares for the holders of Gem stock and the remainder of the million shares in the treasury. The lease runs six months from September 21. It has recently obtained an extension of territory and now has 250 by 300 ft., lying between the Baby Florence and the Engineers. Work has been started with two shifts of miners.——The mines of Goldfield produced during the week ending September 26 a total of 2371 tons of an estimated value of $213,750. During the same period the Tonopah mines produced 5243 tons of an estimated value of $141,225.

LINCOLN COUNTY.

The first consignment of the new stamp-mill for the Lloyd-Searchlight has arrived at Searchlight and is now being hauled down to the mine at Camp Thurman.——W. W. Hurt, of the New York Searchlight, has started work on several of his properties. The Waterspout claim is being equipped with a 12-hp. hoist. This will do service for considerable sinking and lateral work until the permanent new plant is installed and then it will be transferred to one of the other properties.——The Cyrus Noble mine has started a few men at work and it is believed that the force will be increased before long. E. H. Bryan, of Redlands, who with J. J. Pendergast secured the property under foreclosure proceedings, is at the property and will have charge of the work.——The Loder gas smelter on the property of the Santa Barbara-Searchlight Co., at Nelson, will be ready to blow in before many weeks and all are anxiously waiting to see its trial run. J. F. Loder, the inventor is now on the ground supervising the erection.

HUMBOLDT COUNTY.

George & English, lessees on the well known block of ground on the Fine Gold estate, have secured an agreement with the management of the Mazuma Hills mill to treat 150 tons of ore from the lease, and stoping operations began last week on one of the ore-shoots in the lower adit.——The Lookout M. & M. Co. has been incorporated to work a lease on two promising blocks of ground on the Therien estate. Fred L. Tyler, the moving spirit in the new Company, has been operating what is known as the Tyler lease, on the same ground, for more than a year, and has now secured a lease on the Pierce block. The two will be operated as one and extensive development started at once.

NYE COUNTY.

Construction work was resumed on the Campbell-Smith custom mill at Rhyolite last week, and the promoters of the enterprise expect to have the plant completed in a short time. It was to have been completed long before this, but sundry misunderstandings and other drawbacks led to a suspension of operations. The machinery is now all on the ground, and it is stated that the work will be pushed to completion as rapidly as possible.——I. M. Williams, who has secured a two years' lease on the property of the Rogers Round Mountain Mining Co., has already started work, and is sinking a shaft. The terms of the lease require 350 ft. of shaft work. The Tonopah Mining Co. has declared a dividend of 25c. per share, payable October 21. This is the second dividend this year, the first one having been distributed in July.——The Berry-Roche and the Chapman mills, at Manhattan, have reduced their charges for treating ore. The new scale is as follows: For ore worth less than $20 per ton the charge is $5, and for each additional $5 in the valuation of ore an extra charge of 40c. is made, the maximum charge being $8.——It is reported that a company to be known as the Bare Mountain Apex Mining Co. is being organized at Boston. The Company has strong backing and will take over the properties of the Norwich Consolidated Mining Co. in the neighborhood of Beatty. Several additional claims may be acquired if reports are satisfactory.

STOREY COUNTY.

Another old mine on the Comstock, the Crown Point at Gold Hill, is being rehabilitated. This makes two famous bonanza mines in operation there—Crown Point and Yellow Jacket. In Virginia City the Chollar, Consolidated Virginia, and Ophir are producing steadily, and the Ward and Union are in active operation. The Comstock is seeing a brighter day and presents a more favorable outlook for the future than in many years. Every month the actual output of the Comstock reaches many thousands of dollars.

WHITE PINE COUNTY.

The Nevada-United Mines Co., of Denver, operating at Ward, is shipping 20 cars of ore per month to one of the Salt Lake smelters. The ore is a sand carbonate, carrying 10 to 15% excess in iron and assaying from 40 to 50% lead and about 6 oz. silver. The vein is 20 ft. wide and the ore is shipped without sorting. It is highly probable that the Company will begin dividend payments at an early date.——A big strike in the Hole Card property, at Blackhorse, has greatly stimulated the interest in that camp. The find was made in a 15-ft. shaft, the bottom of which is all in ore that pans exceptionally well. The Hole Card is owned by Boone Tilford, an old pioneer of the district, and by the Stephens estate, and is directly across the gulch from the famous San Pedro property.——F. B. Weeks has a force of men at work on the Fort Wayne group at Blackhorse, which he recently bonded. He has also leased the Whitney mill at Osceola, and will begin active work in getting it in running order. It is rumored that the Nil Desperandum, also at Blackhorse, will shortly resume operations.

UTAH.

BEAVER COUNTY.

W. M. Wantland, R. G. Wilson, and associates have secured control of the Iowa No. 4, 5, 6, and 7, in North Star mining district, and will start active developments at once. The property adjoins the Wild Bill, on which a depth of

200 ft. has already been attained and some good ore-bodies exposed.——The Cedar-Talisman Consolidated Mines Co. is to be organized to take over the interests of the Cedar and the Talisman mining companies in the North Star district. The capitalization will be 1,000,000 shares of a par value of 25c., 300,000 of which will be reserved as treasury stock and the remaining divided among the present shareholders of the two companies. The consolidation has not yet been ratified, but undoubtedly will be, because all those interested are in favor of the scheme.

JUAB COUNTY.

A strike was recently made on the 700-ft. level of the Swansea Consolidated which is believed will make a producing mine out of that old-time bonanza.——The shaft-house and other buildings of the Little Chief Mining Co., at Eureka, were destroyed by fire on September 17. The machinery was badly damaged and the catastrophe will mean a three months' set-back in the development of the mine. The buildings will be re-built at once.——The Tintic Standard Mining Co. is now placing in position a new and powerful hoisting plant to supplant that with which development work has been done up to the present time. The management at present is driving on a vein on the 420-ft. level that should make into ore of good grade at any day. The formation is a dolomite lime, heavily charged with iron and manganese and small quantities of lead and silver.

SALT LAKE COUNTY.

The Boston Consolidated has started four additional units at its Garfield concentrating plant, making eight now in use. The capacity of the plant is now nearly 2000 tons of crude ore per day.——The management of the Fortuna mine in Bingham has decided to try the leasing system and several blocks of ground will be set aside for that purpose. The Fortuna has a very creditable shipping record for both silver-lead ores, as well as copper, and for some time prior to the panic of last year it was a regular contributor to the local market. The mine is adjacent to the Ohio Copper Co.'s domain and has long been regarded as being an attractive property.

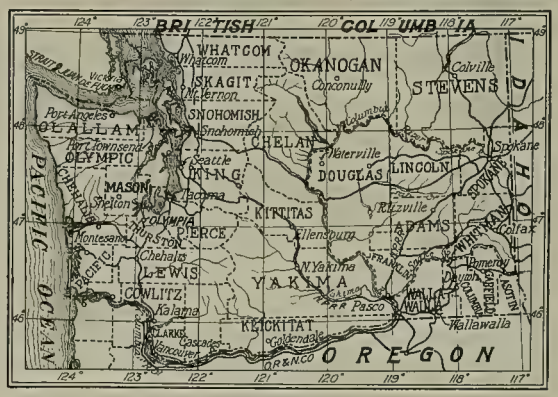
SUMMIT COUNTY.

At a recent meeting of the stockholders of the New York Bonanza Mining Co., of Park City, it was decided to recommend to the directors that the shaft be deepened to the 1000-ft. level. The officials which served during the past year were re-elected.——The Conkling Mining Co. has been formed to operate the Conkling and other claims at Park City, controlled by Col. N. Treweek and associates. The new Company is capitalized for 500,000 shares of the par value of $1 each, with 200,000 shares of treasury stock. Officers and directors of the Company are: Nicholas Treweek, president; William C. Hall, vice president; J. Leonard Burch, treasurer; George A. Land, secretary.

WASHINGTON.

OKANOGAN COUNTY.

(Special Correspondence).—W. D. Greenough and two other mining men from Spokane, have been examining mines on Copper Mtn., near Chesaw. It is reported that a deal of considerable importance is under way.——The Poland China mill is being overhauled.——The Molson Gold Mining Co. has elected a new board of trustees, with A. L. Norris, president; C. F. Rankin, vice president; A. D. Ogden, secretary; W. J. Morey, assistant secretary; and F. W. Rankin, treasurer. The executive officers are all residents of New York. The Molson mill is being overhauled. The rolls are being replaced by stamps, and the capacity will be increased from 40 to 100 tons. It is expected the plant will be run steadily after completion of the improvements.——A large body of ore has been found in the Azteg group, in Chesaw district, assaying 1.9% copper, $4.13 gold, and 4 oz. silver per ton. The Azteg, Homesteak, Neutral No. 9, and Western Star claims compose a group under bond to E. P. Galliac. The group is on the east side of Copper Mtn., on the same vein system as the Grant group, and is considered a very promising property. The ore is magnetite in pyrrhotite. The deposit is about 400 ft. long.——Work has been resumed at the Kimberley mine, near Golden camp, on Palmer Mtn. A shaft, which was sunk 100 ft., is being continued on the vein to the 200-ft. level. At that depth drifts will be driven on the vein preparatory to stoping. The mine is equipped with steam machinery and an air-compressor. ——The Golden Chariot Mining Co. has begun work on a group of copper bearing claims, on Kruger Mtn. The ore is of average quality, and the Company expects soon to have the property on a paying basis and to be shipping ore.——An immense bed of asbestos is reported 14 miles southwest of Twisp, said to be 400 ft. wide and traced 2500 ft. along the cropping. Specimens of long, white, silky fibre have been shown as average specimens. Several claims have been located by W. O. Canfield and William Johnson.——The Chelan Butte Gold Mining Co. has been organized, with capital stock of $1,000,000 divided into $1 shares, of which 400,000 have been placed in the treasury. The Company has taken over the Columbia, Butte, Little Butte, and Dakota claims, in the neighborhood of Lake Chelan. Considerable work has been done on the group.



Map of Washington.

A contract has been let to run an adit 300 ft., to cut the vein at about 200 ft. below the surface workings. The vein is rich in gold and, it is believed, will be a big producer. The headquarters of the Company are at Chelan. ——A steam engine and air-compressor and full equipment of power drills have been installed at the Holden mine, on Lake Chelan, and air-pipes have been laid to the No. 2 and 3 adits. Two shifts are employed on those drifts. Work is being kept going day and night in the No. 1 and 2 adits, and a good grade of ore is being broken. This property is owned by the Holden Gold & Copper Mining Co., of which J. P. Graves, of Spokane, is president. It is stated that activity on this property will be largely increased as soon as the Spokane & Inland railway reaches it, and heavier machinery can be laid down at reasonable rates.——The Chelan Consolidated Copper Co., operating four miles west of Phelps creek, has driven an adit 1000 ft. deep and intersected three veins which are from 4 to 10 ft. wide. Some of the assay returns from samples are reported to be large. One vein of white quartz, over 50 ft. wide, has been traced over 1500 ft. across the mountain.

Chesaw, September 24.

CANADA.

BRITISH COLUMBIA.

Frank B. Cook and M. M. Johnson, of Salt Lake City, have secured a bond on the Golden Fawn group of claims on Sheep creek, 12 miles from Salmo, the sum named in the bond being $40,000. It is reported they have agreed to expend $2000 per month on development work. They have gold ore in quartz and quartzite which runs $50 to $150 per ton. The Nugget, an adjoining property, belonging to W. B. Pool, George Wells, and A. H. Gracey, of Nelson, has shipped ore to the value of $24,000.

Special Correspondence.

LONDON.

The Dull Season.—A Favorable Time to Develop Copper Properties.—British-Butte Mining Co.—Announcement of Extraordinary Gold Content in Placers.—Rhodesian Mines.

The latter half of August and the whole of September are always quiet periods in the City of London, and nothing but bare routine work is done. Everybody is holiday-making. No board meetings or shareholders' meetings are held. New business is not undertaken or discussed. The financial papers shrink to half their normal size, and it is not a good time for London correspondents of American papers. In fact, I feel inclined to follow the example of the late Sir Stafford Northcote and give a lecture on 'Nothing.'

The last six months or so has been the dullest time for a good many years. The fall in copper, lead, silver, and tin has been fatal to new ventures, and in consequence of this more difficulty in securing employment is experienced by mining engineers than has usually been the case. Even the members of eminent firms, and eminent individual mining men, are waiting for something to turn up. The stock exchange feels the absence of business, and members are occupying themselves in a sort of hopeless effort to stir up a boom in South African gold shares. There seems to be no chance of such a boom succeeding. Though the monthly output is advancing, the element of chance to make a speculation attractive is absent. The Rand industry is too well established, and its methods and possibilities too well known, to evoke enthusiasm for the future. Old established mining businesses, like Rio Tinto, boom with the rise in copper. There is no rise in the price of gold; hence established gold industries don't boom. A few weeks ago I noted the appearance of a certain new company as an indication that capital was once more becoming available for new mining operations, but this was premature, as the flotation was not a success. Many promoters and moneyed men say it is no use to open up new copper deposits while the price of copper is low. Several prospecting and development companies have recently suspended operations on copper properties for this reason. It seems, however, that the period of low prices is the best for these preliminary operations. It takes a long time to get a copper deposit into shape for shipping or smelting. The new company that is ready to profit by a boom in prices is the one that wins, and the company that awaits a reviving market is likely to be ready merely in time for the next slump.

An American mining concern, having a London office and following is the British Butte Mining Co. It was registered under the laws of Montana in 1906 for the purpose of working the Blue Bird placer deposit at Butte, Montana. According to a statement made at a meeting held in London last year, the working capital was £90,000. A circular issued this week states that the placer has been thoroughly prospected by means of bore-holes, and that a shaft has been sunk 690 ft., below which a bore-hole has been driven another 300 ft. A cross-cut at the bottom of the shaft has been extended 975 ft., partly through placer ground and partly through granite. According to the reports, all the drill-holes and workings show the presence of gold, varying from 30 cents per cubic yard upward. It is intended to work the upper 45 ft. by means of dredges, one of which is to be on the ground before winter sets in, and nine more are to follow later. The deeper parts of the placer are to be treated by cyaniding. The excavation is to be by open-cut and effected by steam-shovels. The scheme is to eventually have a large plant that will handle 20,000 cubic yards per diem, and the cost is estimated at 20 cents per cubic yard.

During the last two months I have given some details of various Rhodesian mines, more particularly the Wanderer and the Selukwe. This week the latest details relating to the Globe & Phoenix are to hand. These properties are situated in the Sebakwe district, 140 miles north of Bulawayo. The company was formed in 1895 and milling commenced in 1900. For some time the Globe was the more profitable, but this mine is exhausted, and operations are now confined to the Phoenix. The most noteworthy point is the great depth at which work is being done, namely, 2300 ft. In spite of the increasing difficulties, the cost of mining is being reduced. During the first six months of this year the mill crushed 34,546 tons and produced 15,617 oz., which realized £65,590. In the cyanide plant 25,644 tons of sand yielded 2225 oz., worth £9345, and 11,055 tons of slime produced 968 oz., valued at £4068. The total yield was 18,810 oz., valued at £77,339. During the 12 months of 1907 the total yield was 39,791 oz., so that production is well maintained. Any decrease is due to the fact that the extraction in the slime-plant has not been efficient, owing to the presence of sulphides and antimony. For some time the results were so poor that the slime was stored and allowed to oxidize, after which the extraction improved wonderfully. Although the storage and re-treatment involved two handlings

Map of Butte District.

of the material, the increase in the extraction from 40 to 90% made up for this extra cost, and in future it is probable that the total extraction will be permanently improved. It is interesting to note that the total extraction since the commencement of operations in 1900 has been worth £1,394,650, and the operating expenses £803,631, leaving a gross profit of £591,019, exclusive of depreciation, office expenses, and other incidentals. The total costs during the half-year were £50,530, including mine development, but not including depreciation and London office expenses, leaving a gross profit of £28,475. The costs work out at £1 6s. 11d. per ton, as compared with £1 8s. 1d. during the year 1907. The economy has been in mining, which has been reduced from 8s. 6½d. to 7s. 2¼d. Mine develpoment is charged 4s. per ton. Development during the six months has opened up additional bodies of ore, and the reserves have been increased from 107,309 tons on December 31 to 122,408 tons on June 30, and the average contents have increased from 11 to 12¼ dwt. per ton. The directors have declared two dividends of 5% so far this year, the amount thus distributed being £20,000. The total distribution to date has been 160% on the capital of £200,000, but it must be pointed out that this is not the actual return to shareholders, for 50,000 of the £1 shares were issued at £2 and 25,000 at £4. These high premiums were obtained in 1895 and 1899, when Rhodesians were booming. The present quotation of the shares is about 16 shillings. The township on which the mine

stands rejoices in the name of Que Que, which is as euphonious as your Oshkosh and Skidoo.

I have referred lately to the great depression at the various silver-lead mines of Broken Hill, in New South Wales, and have recorded that one mine has closed down and that others have had their profits annihilated by the low prices of the metals. The North Broken Hill has just issued a report for the half-year ended in June. Though the profits have been much smaller, the company does not appear to have been hit so hard as some of its neighbors. The mine is improving and is becoming one of the most important of all in the district. For the half-year in question a working profit of £32,407 was made and £14,000 distributed as dividends, being at the rate of 10% on the capital of £140,000, the remainder being partly kept in hand and partly written off for depreciation. A year ago the distribution was £35,000. The ore treated during the last half-year amounted to 65,633 tons, assaying 15.92% lead, 6.49 oz. silver, and 13.69% zinc. The lead concentrate produced weighed 11,062 tons, assaying 70.91% lead, 20.66 oz. silver, and 6.32% zinc. The recovery was 75% of the lead and 5.67% of the silver. The zinc tailing produced amounted to 33,235 tons, assaying 4% lead, 3.67 oz. silver, and 18.9% zinc. This is sold to the De Bavay Company, whose flotation plant adjoins. The orebodies are opening up in a remarkable fashion and the reserves exceed a million tons.

BUTTE, MONTANA.

New Troubles from Fires in Anaconda and St. Lawrence Mines. — Pennsylvania Mine Resumes.—Pilot-Butte Shaft to be Deepened. —East Butte Co.—North Butte Co.'s New Shaft. — Reduction of Railway Rates on Ores. — September Output. — Little Mina. — Barnes King Mines.

The State Board of Railroad Commissioners has made an order directing the Northern Pacific Railway Co. to reduce rates on ore shipments from all points of Montana to Butte and East Helena. The rate reduction amounts to 36% on shipments to Butte and 17% on shipments to Helena. The same order will soon be issued to other roads. Heretofore freight rates on ore have been practically prohibitive for small operators throughout the State. At the hearing before the Commission, the railroads, admitting the injustice of their rates, offered a reduction of 25%, but the shippers demanded a reduction of 41%. The conclusion reached by the Commission is evidently a compromise. It is anticipated that ore shipments will increase greatly as a result of the reduction of rates.

The danger of a coal famine in Butte has probably been averted by a temporary adjustment of the coal strike troubles in northern Wyoming. The miners of three of the large companies operating there have accepted a proposition to return to work pending a settlement of their grievances. In southern Montana, however, the miners are still out, and it seems to be the determination of the Union Pacific and Amalgamated Copper Co. to fight the trouble out. The Montana operators insist on a reduction in the wage schedule and the miners refuse to accept a reduction. The present schedule expires October 1.

With the exception of the interruption to mining in the Anaconda mine by the existence of gas, all of the properties of the Amalgamated Copper Co. are again working. Interruptions from this gas have been becoming more frequent during the last six months, which seems to indicate that the fire is growing more serious. Fire has been burning in the Anaconda and St. Lawrence mines since 1889, and all efforts to extinguish it have been futile, as the fire feeds itself on the sulphide ores. The portion of the mines where the fire prevails has been flooded, and boreholes have been put down from the surface, through which streams of water have been run, but it has had no effect on the fire. The only effective measure was to wall the fire in with cement. But it often breaks through somewhere, or a crack in the rock permits the gas to escape. It is often impossible or difficult to find the leak, and it breaks out or appears in unexpected places and the miners are driven from the mine. A little of the gas is sufficient to prevent men from working. The latest outbreak was chiefly in the shaft, and during the shut-down some mining was done through the St. Lawrence and Neversweat shafts, both of these mines being connected with the Anaconda. The latter employs about 500 men and hoists about 550 tons of ore per day.

The resumption of operations in the Pennsylvania mine adds materially to the production of the Butte Coalition Co. The Boston & Montana, under a mutual agreement, mines jointly-owned orebodies known as the Red Penn, in which the Butte Coalition has a 40% interest. The ore is high-grade. The Butte Coalition Co. is mining 900 tons of ore daily and is doing much development, principally from the new Tramway shaft, though the Rarus mine is also being opened on lower levels.

The Pilot-Butte Copper Mining Co. will not abandon the Pilot claim, but will resume work on it shortly. The shaft will be deepened to probably 2000 ft. This was decided on at a special meeting of the stockholders held at Milwaukee recently.

Orders have been received to prepare for a resumption of work in the East Butte Co. mines, and Superintendent Vail is engaged in unwatering shaft No. 1 and the lower workings. The main shaft is 900 ft. deep, and it will be sunk to 1500 ft.. It is unlikely that much exploration will be done above the 1500-ft. level, although there is ore all the way from the surface to the 400-ft. level.

It is reported from Duluth that the North Butte Co. is making plans to sink a second shaft. It would seem that the most likely plan would be to sink the Berlin shaft, which the Company contemplated doing a year or so ago. Levels are being opened from the Speculator shaft into the Berlin ground. The Speculator shaft is taxed to its utmost capacity when 1200 to 1500 tons of ore are hoisted daily. There is enough ore in sight to justify a daily output of 3000 tons, and a production of 80,000,000 lb. of copper per year, which the Company could do with two working shafts.

Butte stockholders of the Davis-Daly Estates Copper Co. have received official notice of the action taken at the recent meeting toward the organization of a new company, to be known as the Davis Daly Copper Co., and provision for the exchange of stock on the payment of $2 per share.

The September copper production by the Butte mining companies aggregated 29,055,000 lb., against 26,121,000 in August. The total ore tonnage was 387,600 tons, against 355,500 tons in August. The average daily output of ore and copper yield per ton, and the average daily copper production for the 30 days of September were as follows:

	Daily Tons of Ore.	Yield per Ton.	Daily Copper Production, lb.
Boston & Montana	3,000	78	234,000
Anaconda	3,800	65	247,000
Butte & Boston	650	64	41,600
Washoe	510	63	32,130
Parrot	430	60	25,800
Trenton	460	60	27,600
North Butte	1,400	96	134,400
Butte Coalition	950	80	76,000
Original	1,280	85	108,300
Pittsburg & Montana...	210	92	19,320
Miscellaneous	230	95	21,850

Although the production of copper by the Amalgamated, North Butte, and Butte Coalition companies is gradually increasing, it is generally admitted by the producers that business conditions and the copper metal market are not improving as rapidly as had been hoped.

William Rockefeller and other members of the Rockefeller family, with several stockholders of the Amalgamated Copper Co., were in Butte last week and took their first look at the great copper mines from which the Rockefeller family is drawing big dividends. Benjamin B. Thayer, assistant to President Rogers of the Amalgamated Co., completed his inspection of the Amalgamated mines, smelters,

and other properties in Montana and returned to New York last week.

The Trenton Co. has finished sinking on the Gagnon shaft for the present and is engaged in cutting a station at the 2300-ft. level. The station is about half completed, and, when finished, cross-cutting and driving will be started. The vein is not far from the shaft, and should be reached in a few weeks. The work of sinking on the Little Mina by the Parrot Co. was delayed. At the Parrot mine the cross-cutting at the 2100-ft. level has been rather slow work. It had been estimated, when work was resumed in the cross-cut, that the vein would be reached during the first week in September, but it is now said it will be several weeks before it is cut.

John D. Ryan, one of the directors of the North Butte Co., is quoted as saying that the North Butte has so much high-grade ore that it is difficult to get the average shipments below 5% copper, and that the average yield of copper to the ore mined at present is about 100 lb. per ton. The estimates of the officials of the Company vary. In Butte it has been claimed that the average is 120 lb. The average for September, as for August, was a little under 100 lb. The retirement of George Wesley Davis from the board of directors of the Davis Daly Copper Co. is taken in Butte to mean that F. Augustus Heinze and his close associates are no longer in control of the Company, although Mr. Heinze remains the nominal head. The properties of the Company are practically idle, awaiting funds under the re-organization. Butte stockholders are not very enthusiastic over the $2 assessment as a basis of stock exchange.

The Barnes-King Development Co. continues to earn a little money above expenses. The bullion receipts for August, according to the report of Manager McGee, were $30,345, and the expenses amounted to about $23,000, including the cost of development and prospecting. If the Company continues the rate of earnings of the past three months it may soon pay a small dividend. On a capitalization of $200,000 instead of $2,000,000 the Barnes-King might yet make good.

SALT LAKE, UTAH.

Closing of Tintic Smelter.—Railroad Buying Oil Lands.—Clark Smelter for Las Vegas.— Production from Mercur Mines. — Mascotte Tunnel of Ohio Copper.—Boston Consolidated Mill. — Denver & Rio Grande Improving Service on Bingham Lines.

The closing of the Tintic smelter last week will have the effect of greatly reducing ore-production from the Tintic district for a while. Metallurgists who have followed the construction of the plant are not surprised; in fact, the interruption has been anticipated. Two months or more ago defects were pointed out to Jesse Knight, the prime mover in the enterprise, and some were corrected before it was too late; but the matter of ample power-supply was overlooked. An attempt was made to get along with service from the lines of the Utah County Power Co., which has proved to be entirely inadequate, especially during severe storms. The smelting company, however, has contracted with the Telluride Power Co. to bring in its lines; hence it will soon have sufficient electric energy in reserve to meet all contingencies. Patrons of the smelter have been notified to hold back ore shipments until the imperfections are overcome, which will probably be within a month. The Ajax, Uncle Sam Consolidated, Lower Mammoth, Colorado, Iron Blossom, Beck Tunnel, and Dragon Iron mines have, therefore, suspended production.

The San Pedro, Los Angeles & Salt Lake Railroad Co. has become interested in the development of the Juab oil-field, in the eastern portion of Juab county. One rig is in operation and a second will be soon. The opening of several good wells in this region would immediately settle the road's fuel problem. The 'Salt Lake Route' has no coal mines of its own, and in the past two or three years has experienced difficulty at times in obtaining a supply from other sources. Some of the trouble has been overcome by the installation of oil-burning locomotives, which are now operated from Milford westward to the coast. With oil supplied from Utah fields, the use of coal for fuel would be discontinued entirely.

Information comes from a reliable source that W. A. Clark is seriously contemplating the erection of a smelter at Las Vegas, Nevada, which is regarded as an advantageous position for ores from southern Nevada camps. It would be down-hill practically all the way from Tonopah, Goldfield, Bullfrog, Pioche, and other camps. Mr. Clark has seen the Tonopah & Tidewater road cut into the business of the Las Vegas & Tonopah branch, and with the completion of the extension of the Nevada & California through to Mojave, California, there is a further possibility of a loss of revenue to the Las Vegas & Tonopah. Engineers in the employ of the San Pedro, Los Angeles & Salt Lake visited Pioche recently for the purpose of obtaining figures on available tonnage, and it is said that they reported enough ore developed in the Pioche mines to warrant the erection of a large plant. The only discouraging feature found was the possibility of litigation between the Nevada Utah Mines & Smelters corporation and the Ohio Kentucky Mining Co., the joint owners of some of the best property in the district. Subsequent movements, however, indicate that an adjustment has been effected without resort to the courts.

The August bullion production of the Consolidated Mercur mines was approximately $79,000, a substantial increase over the previous month. Recent developments in the Brickyard mine, one of the Consolidated Mercur properties, are important. The Magazine vein has been cross-cut for 57 ft., and the ore assays, according to George H. Dern, the manager, about $6 per ton in gold. The ore from the old Mercur mine averages about $4.

Work is being pushed vigorously in the Mascotte tunnel, at Bingham, by the Ohio Copper company. Colin McIntosh, the manager, is thoroughly familiar with the property, and is achieving excellent results. The mill will be completed by about February 1. The Mascotte adit has not yet reached the main Ohio Copper vein, but it has been passing through good milling material for some time.

Four more units of the Boston Consolidated Garfield mill are in operation, and the remaining units are gradually being finished up and made ready for service. The plant is treating an average of 1800 tons of the Bingham porphyry-ore per day, and the plant is running smoothly. The extraction this month has run considerably higher than in August. The saving will be about 74%, as against 71.8% formerly. Several cents per ton have been shaved off the cost of milling. Boston Consolidated ore does not concentrate as many tons into one as does the Utah Copper ore, owing to the heavier iron content. But this condition may change in depth. At present the Boston mill is putting from 16 to 18 tons of ore into one ton of concentrate, which runs from 19 to 21% copper. Utah Copper puts from 18 to 22 tons of ore into one ton of concentrate, which assays from 20 to 24% copper. The Boston Consolidated is installing in its mill two 'Special' Byron Jackson turbine pumps, replacing pumps of different design. In a recent letter these pumps were wrongly referred to, through a typographic error, as the 'Barr and Jackson'. There is evidently serious doubt in regard to the Denver & Rio Grande Railroad Co. being equal to meeting the demands to be made upon it, unless it provides more motive power for its Bingham lines, something it has been slack about doing in the past. But the officials have awakened to the fact that unless something is done to improve the service a large falling off in the revenue from the copper camp will be the natural consequence. This has been made apparent by the activity of the Utah Copper Co. in making recent purchases of rights of way for the proposed extension of its own line from Bingham to Garfield. The Bingham & Garfield Railroad Co., organized some months ago, took over all the rail lines and equipment owned by the copper company, consisting at the present time of about 15 miles of track, all of which is in service. It would have to build about 16 miles additional to reach the Garfield concen-

trator, and four miles would take it to the Garfield smelter. The Utah Copper Co. will increase the capacity of its Garfield mill next year, and this leads to the expectation that the gap will then be closed, whereupon the copper company will become entirely independent of the Rio Grande in the matter of ore transportation.

The options held by the Utah Consolidated on certain land in Tooele county expire on September 30. Consequently, it is reasonable to presume that a decision will have been reached in a few days relative to the smelter contract which has been under consideration for some time. Daniel Guggenheim stated before leaving Salt Lake last week that the proposition would be brought before the directors of the American Smelters Securities Co. in New York during the present week. Further than that he would not discuss the subject, nor intimate what the decision would likely be. Evidently Utah Consolidated officials have been urging prompt action, for they cannot afford to let the options held on the Tooele property go by default, if it is found necessary for the Utah Consolidated to build its own smelter.

TORONTO, CANADA.

Active Demand for Cobalt Stocks. — Dividends Paid.—Developments at South Lorrain.

Stimulated by heavy shipments from week to week, and still more by the accessions to the number of dividend-paying mines, Cobalt stocks are still booming, with a continually broadening market. A computation of the dividends paid by Cobalt companies since the camp began gives a total of $6,061,520 paid by the thirteen companies that have established themselves on a paying basis. This does not include such close corporations as the Drummond or the O'Brien, nor the profits of individual operators. The Nipissing holds the first place on the list, having returned $2,260,000 to its shareholders. The Temiskaming & Hudson Bay has paid $937,266 in dividends; Kerr Lake, $750,000; Coniagas, $680,000; and McKinley-Darragh, $354,346. The shares of the Chambers-Ferland have recently been put on the market, the amount called for being considerably oversubscribed. This property, the opening up of which was for long delayed by a difficulty as to title, is being rapidly developed. Three shafts are being sunk. No. 1 is 100 ft. deep, at which level driving has been done northerly to the La Rose and southerly toward the O'Brien. Shaft No. 2 is down 100 ft., and at 80 ft. a cross-cut has been started to tap a vein 40 ft. distant. Several veins will be worked from this shaft. Shaft No. 3 is down 22 ft. on a cobalt vein with silver content. At the Buffalo two nuggets, weighing 1500 and 500 lb., respectively, and carrying 5000 oz. silver per ton, were recently taken from No. 12 vein at the 80-ft. level. The company is preparing to install a cyanide plant, which will be the first in the camp. New crushers, rollers, and concentrating tables are being added to the concentrating plant, which will increase its capacity to 100 tons per day. A rich strike has been made at the Watts mine at the 200-ft. level, the main vein, 10 in. wide, containing much native silver, while silver shows in the wall rock through a width of 4 feet.

Development is going forward actively in South Lorrain, where it is estimated that about a thousand claims are being prospected and worked. People connected with the Kerr Lake and Nova Scotia mines have secured over fourteen properties, and a Buffalo syndicate has bought 22 claims. The Bousquet mine recently yielded a nugget weighing 147½ lb., of almost pure silver. The Proprietary Silver Mines has large interests in this area, and has struck a vein rich in silver and cobalt. The Weltlaufer property is yielding ore containing large masses of native silver.

Development in the Montreal River district is proving up valuable ground. Rich shipping ore is coming out of the Mother Lode mine, in James township. This property was purchased from Herbert Gates by a syndicate headed by W. R. Mowery. At a junction with a cross-vein, a mass of calcite, smaltite, and silver, assaying from 2000 to 6000 oz. silver was found. For 30 ft. the average was 2000 ounces.

JOHANNESBURG, TRANSVAAL.

Main Reef Outcrop Extension.—Open Prospecting.—Government Assaying for Prospectors.—Rand Mines Expenses.—Mine Signaling. — Rhodesian Wages. — Mines Department and Shady Schemes.—Prevention of Fraud.

As noted a few weeks ago, the eastern part of the Rand presented a development meriting close attention by reason of the rich strike made in the vertical shaft of the Brakpan mines. The high assay value and big width of ore are being maintained in the drifts. But during the last two weeks public interest has been drawn to the other extremity of the Rand, some 40 miles to the west, where the extension of the Main Reef has shown a strange eccentricity. The last mine on the Main Reef (assuming the Botha reef, Randfontein reef, and Main reef to be justifiably correlated) in the extreme west is the Stubbs Randfontein. South of this, the series had not been found. On the dip of this property lies the South Randfontein Deep, always regarded as a 'deep-level'. It has been found, however, that instead of containing its normal north and south strike, the Leader and West reef worked in the Randfontein mines turns sharply to the east and thus converts the supposed 'deep-level' into an 'outcrop' mine. As yet little has been done upon the new strike, but the American engineers of the Newmann & Goerz groups (Thompson & Cameron) have been able to issue a favorable report upon the outcrop occurrence, which shows good ore. That outcrop prospecting should today be proceeding upon the Main Reef within the area of the Witwatersrand goldfield would scarcely be believed as possible by any engineers acquainted with the locality, without such specific explanation of this erratic turn or throw of the formation.

With the exception of the pseudo-dramatic outbursts of Mr. Wybergh, formerly Commissioner of Mines, and now a self-styled champion of the people, who has asserted that the Precious and Base Metals Bill was the outcome of a conspiracy between the land-owners on the one hand and the mine-owners on the other, the most notable recent Parliamentary discussion upon matters pertaining to the industry has been that connected with 'open' prospecting. Mr. Wybergh's financial friends have persistently advocated the introduction of a policy of open prospecting with the greatest vigor, but the weightiest arguments in the world appear to be of no avail against the stolid obstinacy of the Boer Government, which is so strongly established as to render further explanation of its policies superfluous. According to the new bill, prospecting can be carried on upon proclaimed crown land, on all unproclaimed crown land, on unproclaimed private land "on the written request of the holder of the mineral rights," and on unproclaimed private land on which no bonâ fide prospecting and no bonâ fide agricultural operations are in progress. Drummond Chaplin moved an amendment providing for a widening of this field in accordance with the principles he has long advocated on the platform and in the press. Thoroughly to appreciate the justice of his wish to see every farm open to the prospector, after giving three months' notice to the owner, one should possess a knowledge of the great size of the average Transvaal farm (perhaps about 6000 acres) and the very small proportion utilized for agricultural, pastoral, or other farming purposes. Moreover, even if the prospector were such a destructive individual as the spokesmen of the farming interest like to suggest, his attentions would certainly be more generally directed to the rocky parts of the land where exposures of formation occur and not to the grassy flats, covered with a cloak of subsoil. A side issue has been raised in the declaration that a community of good prospectors does not exist in the Transvaal. Obviously, the cause of the lack of experienced men has primarily been due to the absence of opportunities, and it may assuredly be declared that men of the right sort would arise, as in Rhodesia, upon the presentation of reasonable inducements. With characteristic stubbornness and lack of foresight, the Dutch leaders are determined, however, to oppose the policy of open prospecting

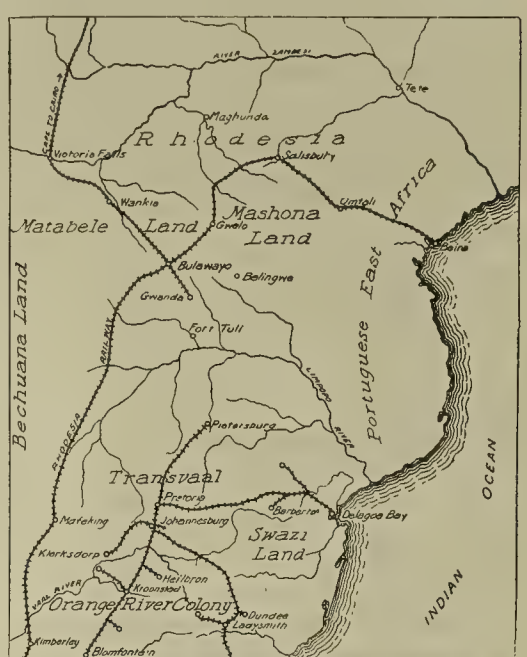
It is satisfactory to note that the Minister of Mines has arranged for the assaying and analysis of minerals for prospectors and others, at moderate fees. It is specified that the special facilities are offered only to those who, in the opinion of the Minister, are worthy of assistance. The tariff includes the following charges: gold, 6s.; gold and silver, 7s. 6d.; silver, 6s.; copper, 6s.; tin, 12s. 6d.; lead and zinc, 7s. 6d.; lime and magnesia, 7s. 6d.; iron, 7s. 6d.; arsenic, antimony, nickel, cobalt, manganese, bismuth, or mercury, 10s.; chromium, tungsten, vanadium, or molybdenum, 15s.; platinum and allied metals, 17s. 6d.; complete analysis of coal (Thompson's method), 21s.; and coal, evaporative power, 5s. Samples can be sent by rail free of charge from any station in the Transvaal, and must be accompanied by an accurate description of the locality from which they have been taken. As usual, the Geological Survey continues to identify minerals, under reasonable conditions, free of charge. The services rendered to the prospector in this direction are certainly considerable, but the stimulus given to the mineral exploitation of the country by these concessions would be quite insignificant in comparison with what might be done if the Government adopted the policy of 'open' prospecting.

The quarterly returns of the Rand Mines subsidiaries, in their customarily analytical form, provide an informative statement as to the present working costs upon the best managed deep-level mines. The group includes deep levels of various types—the Durban Roodepoort Deep with its narrow gold carrier, the wide-veined Crown Deep and Rose Deep, and the much faulted Nourse mines. Their stamp-mills range from 60 to 200 heads. The analysis of results disclose the following: stamp-duty per diem, 5.83 to 7.97 tons; mining expenses, 10s. 8.06d. to 17s. 4.99d. per ton, with an average approximating 13s. 3d. per ton; reduction expenses, 3s. 8.9d. to 5s. 2.3d., with an average of about 4s. 3d. per ton; total expenses, 16s. 11.2d. to 25s. 8.3d. per ton.

Various systems of mine-signaling have been under discussion of late, and several electricians and engineers have been exerting their ingenuity to devise a scheme calculated to reduce the chances of mishaps due to the actions of irresponsible persons (a contingency of special importance in mines employing so many unintelligent native laborers), to negligence on the part of the driver or brakeman, or accidental electric contacts. The whole question has been brought to a head by three papers read before the Transvaal Institute of Mechanical Engineers. One of the authors, G. T. Plumb, advanced the opinion, as the result of wide investigation, that the three-wire parallel system, at present most commonly in use, offers the most advantages for the following reasons: (1) simplicity and few number of wires required, making for efficiency and economy; (2) signals are simultaneously given on all levels, which keeps all persons concerned in touch with the work going on; (3) it prevents the driver from getting a confusion of signals; (4) all signals are transmitted to where the onsetter is working, so that in the event of any authorized person working the cage or skip, he is notified and can attend to the matter. Mr. Plumb therefore condemns all systems communicating with the onsetter alone; also the practice of locking-up or cutting-out bells, which have, when readily accessible, often been the means of saving life by the opportunity provided for a prompt signal to stop hoisting or lowering. He declared that many mines neglected to keep their signaling apparatus in a proper state of efficiency; according to Government regulations, however, a weekly inspection should be made.

Profiting by the surplus of skilled miners available today in South Africa, due in part to retrenchment at Kimberley, a 20% reduction in the standard scale of wages has been arranged by the Rhodesian Chamber of Mines. Though naturally causing dissatisfaction, the inevitable has been accepted by the men without serious trouble. The places of those refusing to work under the new scale have been readily filled. Acording to the new agreement, the principal mines are now paying as follows: miners and timbermen, 18s. 6d. to 20s. per shift; underground shift-bosses, 22s. 6d.; machine-men, (2 drills) 22s. 6d. and (3 drills) 25s. per shift; engine-drivers (hauling), 20s. per shift; carpenters, fitters, smiths, etc., 21s. 6d.; amalgamators, 20s. per 8-hr. shift, and cyanide shift-men, 17s. 6d. per 10-hr. shift.

Whether the Government, through its Mines Department or Geological Survey, should closely follow the development of outside districts and issue reports upon new propositions, after the manner of the Australian and Canadian Departments, is a question open to much debate. Generally speaking, our official authorities have fought shy of publishing opinions upon new mineralogical occurrences in which the public have staked money, fearing charges of interference with private interests and so forth. Whatever the possible abuses of such investigation, the benefits as a rule must far outweigh them. As an example of such independent and disinterested report may be noted the recent exposure of a scheme in the De Kaap goldfield that has been wildly boomed by a firm of outside share-dealers by



Map of the African Goldfields.

means of advertised reports and statements, to the cost of many gullible speculators. The mine used for the purpose of syndicate promotion is called the Verdite—appropriately named, in view of the color of the steatite-schist worked and of the faith of its shareholders. Scrip has been run up to £3 or £4 on the strength of glowing reports. The Government has wisely published the information in its possession with regard to this property, from which it is learned that the spot was one of the first discovered (1885) in the district, that it has been worked spasmodically since that date, that the lenses (irregular and small) of gold-bearing ore yield only 2 to 5 dwt., and that the lenses which contain the gold are so small and erratic that it would be difficult to keep a mill, however small, running continuously on them, unless a large amount of development were done. The dump on the property, representing the rock obtained from the shaft and drifts in ore, is said to be too poor as it stands to be considered an asset or to repay crushing. Greater ingenuity than even the Transvaal promoter possesses must be exercised to reconcile the official report with the statements made by the directors. This matter is referred to at some length, as it tends to show that the outside promoter will have in future to contend with a new factor in sound Government inspection, and the liability of this inquisitive interference with the noble work of the pioneer (using public money) will result in checking many questionable ventures.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Standard silver nitrate solution for titration in determining free cyanide should contain 6.535 gm. of the nitrate to each litre of water.

The mean velocity of water flowing in a channel may be taken as approximately 0.8 of the maximum surface velocity, which latter may be determined by a float.

Steel which is too hard to file may be cut by the following mixture: sulphate of copper, 1 oz.; alum, ¼ oz.; common salt, ½ teaspoonful; vinegar, 1 gill; and nitric acid, 20 drops.

The sensitiveness of a level is usually stated by giving the angle corresponding to a one-inch movement of the bubble. Good engineer's levels have a motion of 120 to 200 seconds per inch, or a radius of curvature of 140 to 85 feet.

Sizes of wood screws are given by a series of numbers. The diameter, D, may be obtained by the following formula:

$$D = (N \times 0.01325) + 0.056,$$

in which N is the number of the screw.

The rating of air-compressors, when expressed in the number of rock-drills to which they are capable of supplying air, is usually based upon a consumption of a volume of air at 60 lb. per square inch pressure, or about 100 to 110 cu. ft. of free air per minute.

The standard boiler-horsepower, according to the Am. Soc. M. E., is an evaporation of 30 lb. of water per hour from a feedwater temperature of 100°F. into steam at 70 lb. gauge-pressure, which is considered equivalent to 34.5 units of evaporation; that is, to 34.5 lb. of water evaporated from a feedwater temperature of 212°F. into steam at the same temperature.

Vara is a Spanish measure of length of approximately 33 inches. It varies even in different parts of Spain, and has a different value in almost every Latin-American country. In Mexico the length of a vara is exactly 33 in.; in Colombia, 31.496; in Chile and Peru, 33.366; in Argentina, 34.122; and in Uruguay, 34.848. A vara is subdivided into *cuartas*, or fourths, which is a dimension more commonly referred to in Spanish countries than the *pie* or foot.

Reversal of the reaction, causing gold to re-dissolve after it has been once precipitated from cyanide solution upon zinc, is due to polarization of the zinc terminal, the electrolytic action between the zinc-gold couple accordingly being stopped. No remedy can be suggested without knowing the cause. The brittleness of the zinc shaving after exposure to the solution for some time may be due to precipitation of salts of lime or magnesia on the zinc-surface, or it may be due to the precipitation of copper. An analysis would be necessary to determine the exact cause of the trouble.

Mispickel is exceedingly brittle, and tends to produce a large amount of fine material when it is crushed, thus causing large losses in concentration. Hence, where the ore is 'bunchy' and labor is cheap, it pays to practice cobbing. Otherwise the ore should be crushed to the least extent compatible with the liberation of a quantity of the mispickel from its gangue sufficient to render concentration on a jig economical. The tailing from the jig should then be re-ground in rolls, classified, and the coarser product concentrated on jigs, and the fine product on some form of riffle-table washer.

Assessment work must be done manifestly for the benefit of the claims, and hence work done by other persons, or by an association of individuals, inclusive of the owner of claims which will benefit thereby, would not apply, unless such work were done upon the claim itself, and was clearly of benefit for the ultimate development and extraction of mineral. The construction of a flume for carrying water to work a claim has been held as inapplicable, except as related to that portion of the improvement which was directly upon the claim in question. It might be accepted, but it could be challenged, and might lead to litigation.

Normal sulphuric acid solution is made up by adding to 49 gm. H_2SO_4 an amount of distilled water sufficient to make exactly 1 litre of the mixture. Sulphuric acid being bi-basic, the number of grains taken to make up a normal solution is half the molecular weight. In testing for alkalinity in cyanide practice, samples of 20 c.c. are taken by the solution man, 2 or 3 drops of 1% phenolphthalein solution are added, and this is titrated with fifth-normal sulphuric acid. Each tenth of a cubic centimetre of the N/5 sulphuric acid used corresponds to a percent of free alkali in the solution being tested. In many plants tenth-normal acid is used, titrated into 100 c.c. of the mill-solution. In this case each unit or percent of free alkali indicated equals 0.056 lb. CaO per ton, or 0.112 lb. KOH, and 0.080 lb. NaOH per ton.

Erroneous location of a mining claim, resulting in the lode-line traversing the claim laterally, instead of longitudinally as desired, has the effect of restricting the locator to that length on the lode which corresponds to the width of the claim, that is, to a maximum of 600 ft. In other words, as construed by the courts in such cases, the originally intended end-lines become side-lines, and the side-lines become end-lines for purposes of determining the extra-lateral right. An amendment of such a location may be made at will, but in so doing the amended location becomes junior to all contiguous or neighboring claims, and cannot concede any extra-lateral right in conflict with those properly pertaining to them. The claimant, under such circumstances, may easily lose more than he would gain by amending.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Orebodies Without Walls.

The Editor:

Sir—For a long time in the history of mining the 'true fissure vein' was regarded as the standard of excellence in ore deposits, and an orebody without walls was viewed with uncertainty and sometimes with distrust. As experience extended, it was realized that many rich bodies of ore fell without the pale of this classification, but still, in many districts, the practical miner clung to the tradition, and often, hoping against hope, strained his imagination in the effort to find true walls in his property where none existed. At the present day, however, the successful exploitation of large orebodies which are clearly impregnations of country rock, and the realization that some of these are far more important commercially than many wall-limited veins, have led some successful operators to frankly declare that they are looking for properties in which the ore deposit has no walls, thus hoping to eliminate some of the commercial disadvantages of fissure veins, such as limited width or the restriction of the ore to shoots.

As the frequent occurrence of commercial orebodies in metallized shear-zones has become a matter of record, it is of interest to know how far such orebodies retain a uniform condition, and what variations in them are possible or to be expected. Since they are specially abundant in Sonora I give the result of my observations in that region, where the variations of importance to the miner are mainly as follows:

1. Diminution or cessation of ore with change of geological formation, as in passing from limestone to quartzite or from rhyolite to granite. In this type of variation is seen the chief disadvantage of an impregnation of country rock as compared with a true vein. In the latter the ore is in a continuous veinstone, filling a fissure, and continuing its character, independent of the rock-formation it traverses. In the former the amount of metal deposited is dependent on the selective power of the rocks through which the metallizing solution flows, or, in other words, the chemical power of the rock to precipitate the metallic compounds. This distinction was specially emphasized at Butte, Montana, where a difference in selective power was observed in two different varieties of granite. At Minas Prietas, Sonora, rhyolite has had a greater selective power than the underlying granite, which is nearly barren of ore as compared with the former. In the Altar district I have seen a shear-zone penetrating quartzite and limestone, in which the latter carried much ore and the former little. The latter case may, however, involve the quality of porosity or even of solubility.

2. Lateral off-setting through constriction of the zone of flow and change of direction. The effect of this is similar to that of a fault in a fissure vein. In the shear-zone, however, there is often no particular fissure or fault-plane which by its direction may suggest where the continuation of the orebody may be found.

3. Longitudinal constriction or limitation of flow. This results in shoots of ore similar to those in fissure veins. Sometimes when the ore is continuous such shoots occur as wider and richer portions of the metallized shear-zone. The shoots are sometimes separated by masses of shattered rock, barren of metal, and in the nature of 'horses.' Below and above the horse the shoots may unite.

4. Local deposits of quartz which at the surface resemble croppings of fissure veins, but which may be limited longitudinally and in depth, although the ore may continue horizontally and vertically. The limited extent of these quartz masses may discourage an inexperienced person, but the distribution of the ore is generally quite independent of them. As this class of deposits becomes better known and its variation and possibilities are classified and put on record, undoubtedly other variations will be made known.

F. J. H. MERRILL.

New Rochelle, N. Y., September 12.

Tailing Wheels or Pumps?

The Editor:

Sir—I have noticed from time to time that the South African mining companies are discarding tailing-wheels for centrifugal pumps, but, like W. L. Reid, I cannot see how the centrifugal pump can be compared favorably with tailing-wheels, either as to efficiency or cost of maintenance, especially where the entire mill product, both sand and slime, is to be handled. Neither can I see that it is necessary, as your editorial suggests, to parallel the tailing-wheel with some other mechanism to serve in emergencies, any more than it is necessary to have two systems of rock breaking at the head of the mill. The Tonopah Belmont mill has two tailing-wheels, of the inside-bucket type. One measures 30 ft. over all, making 5½ rev. per min., elevating 200 tons of sand and 1200 tons of solution each 24 hr. from the battery discharge, and delivering to Huntington mills and concentrating tables, driven from a 7½-hp. motor, with three reductions of speed. The actual power consumed after starting is about 5 hp., figured at $8 per horse-power, making a cost per ton of 0.09 cent. The other is 48 ft. over all, making 4 rev. per min., elevating 200 tons of sand and 1500 tons of solution each 24 hr. from table-discharge to cone-classifiers at the head of the cyanide plant, driven from a 10-hp. motor with three reductions of speed. The actual power consumed after starting is about 6½ hp., figured at $8 per hp., making a cost per ton of 0.12 cent.

The experience here has been that the tailing-wheel is the only mechanism in the mill which has worked continuously during the life of the mill, 16 months, without any repairs other than the shortening of a belt, which was done while the mill was down, due to other troubles. With three 6-in. and

three 4-in. centrifugal pumps, handling Butters filter stock solutions, and agitating slime, one man is kept busy during an 8-hr. shift each day, packing, repairing, and keeping the pumps in running condition, while the tailing-wheels will run with the regularity of an eight-day clock.

A. H. Jones.

Tonopah, Nevada, September 23.

Lives of Mines.

The Editor:

Sir—Referring to the editorial affirmation, in your issue of September 26, that "the big money in mining is made by developing a young possibility into a profitable property," it may be assumed that the intent was to limit the application of the advice to a class of deposits which are capable, as you say in the next line, of being "finally developed." The Rand 'banket' may accordingly be taken as the type. The 'big money' is indeed made in the way you intimate —when it is made at all. Events of this kind are rare; that is precisely why we hear of all of them. In the aggregate the number is important, for the earth is big, and Nature has been fairly generous, but the sad stories of her coquetting with fortune-hunters fail of record and advertisement before the world. Men rejoice in success; they bow down to and worship it; they shrink from the contemplation of failure. Statistics are quite unavailable in support of contentions either way, yet the evidence is strong enough to command universal belief that more money is lost than won in developing prospects. Development companies almost invariably abandon the game of taking infant mines and rearing them in the way they should go. The infants are apt to develop ugly traits and lead the hopeful foster-parent into wasteful expenditure. To abandon simile, the fact seems to be that a corporation, or a man of means, capable of undertaking large enterprises, wins success more certainly by paying someone else for his courage and luck in development than by taking these initial risks.

Your editorial comment is, in effect, a denial of the possibility of accepting mines as articles of traffic in accord with legitimate business principles. This seems to be a view originating in the pioneer attitude toward natural resources. Even virgin lands are a basis for gambling and wild speculation in the opening of new countries, and fortunes are lost and won in them before the conditions of rainfall, frost, drought, and soil-adaptability have been ascertained. The period of speculation encouraged by uncertainties is of comparatively short duration in colonization, but while it lasts it offers resemblances to the conditions which give to mining its unfortunate romantic character among the forms of human industry.

In the interest of sounder and saner methods, speculative features should be stripped from mining to the utmost possible degree. Mining should be rendered as safe as conditions will allow, and under intelligent technical and financial guidance an immense amount of risk may be eliminated. That should be the aim of all men having the interest of the mineral industry at heart; it has been the aim of the Mining and Scientific Press, otherwise there would be no reason for its existence. Belief in the possibility of lessening the speculative features in the exploitation of the mineral wealth of nations is the reason why geological surveys are instituted. Lingering disbelief in the feasibility of reducing the development of mining to a rational economic basis may be the reason why the legislators at Washington are so niggardly in their appropriations for the support of the Geological Survey. One of the disabilities under which mining labors in this country, and in all new countries, is that mines are not looked upon as possessing rational and reasonable market values. Coal lands are no longer a gamble. They are paid for at so much per acre, based upon proper discount of the future. Iron mines are appraised in the light of ore producible; copper mines have taken a far more dignified position in the commercial world than they occupied a few years ago. Men now appraise copper mines and fix the value of copper stocks with reference to the ore developed, rather than in fond reliance upon the glittering possibilities beyond the drill.

The point deserving emphasis is that mines should be regarded as legitimate assets, as properties having rational and ascertainable values. It is insistence upon the speculative feature which gives undue prominence to the 'possibilities and probabilities' figuring so high in promoters' prospectuses. The farmer is a gambler too; he gambles on the rain; he gambles on the blight, and the bugs, the state of the market, and the railroad rate. But the price of land strikes a level on the basis of the average crop. The manufacturer gambles on the future demand for his finished product, on the cost of raw material, on the stability of labor conditions, on the peril of new inventions, and on loss of the advantage of what at the moment is the latest type of plant. All human effort is in one sense a gamble. But we do well not to insist upon it. It is better to frown on the word 'luck'; to exalt the intelligence that grapples with Nature and makes her yield to our control. 'Gamble' is a hard word; it suggests the wrong thing for sapient men; and 'speculation' is its half-brother. We must, as far as we can, get down to business, and realize that the sanest endeavor is that which gives a fair equivalent. The vendor of a mine usually does not want to give a fair equivalent. That is why you, Mr. Editor, remarked, in what I assume was a fit of melancholic desperation, that "when a mine is finally developed, it is well to let the other fellow have the 'investment' while you look around for another 'speculation'." This view is distinctly discouraging. If a man owns a good thing, but cannot develop it, he is doing a good stroke of business to sell it for what it is demonstrably worth, and no mine is worth more to a buyer than he is sure to be able to get out of it. This cuts severely across prevalent customs; nine-tenths of the so-called 'mining men' in America will rage at the suggestion; but ten years hence nine-tenths will think the other way, if the signs in the heavens are not misleading. The tendency is toward more and more sanity in mining. Even prospecting may become a matter of systematic scientific investi-

gation, as it has become in most of the European countries. All along the line the modern tendency, with the increasing application of expert knowledge to industry, is to eliminate the element of chance.

It is too much to ask even the editor to be consistent. It was Emerson who said that consistency was the vice of little minds. The response of the intellect to the passing show gives rise to varying opinions. So I am pleased to turn to your editorial of April 25 on the 'Yukon Gold,' and quote, "We do not ask whether the mining operations will be profitable, but whether they can repay the capital and a reasonable interest." That should be the rule applying to every mine. That is the rule which would guide an investor in a mercantile or manufacturing enterprise. To draw a distinction between mining and other forms of endeavor is to stunt the development of a noble industry which is basal in the augmentation of actual wealth; it is to deny to it the sanity which gives dignity, and to lessen the value of engineering services in lifting it out of the realm of accident into the class of regulated industries. Several leading companies with widely scattered mining interests have been following closely the plan of paying no more for a mine than the net value of the ore developed. That rule even allows for a large element of chance in recovery of the invested capital, but it marks an advance toward commercial methods which is desirable for all concerned, for the prospector, for the promoter, for the investor, and for the engineer. In this connection it may be interesting to note that a class of prospector is becoming common, working upon a new principle, namely, that of 'large sales and small profits.' He goes at the business systematically. He not only invades the 'boom' camps, but he investigates the quiet camps. He has claims widely scattered, but selected judiciously, with a view to their being needed presently. He places no exaggerated value upon them. According to conditions, he may sell a claim for $500, for $1000, perhaps now and then for $5000, and rarely for a large sum. In this way he averages a good income. He is in mining strictly as a business, not as a gamble. This is another of the healthful signs of the times which everyone should greet with satisfaction.

COMERCIANTE.

San Francisco, September 28.

Cost-Keeping.

The Editor:

Sir—I note an interesting letter in your issue of July 25, by H. E. West, on 'Cost-Keeping.' While my experience in mining is rather limited, I have had considerable experience in using and installing some of the various cost-keeping systems in contracting and engineering works, and I am unable to see why the same principles do not apply in both cases, as they are fundamentally the same, having to do with the management of mine and machinery to obtain a maximum output with a minimum expenditure.

I think Mr. West strikes the 'right ground' except where he says, "the ideal manager is he who, while never having to leave his office, yet is perfectly posted by daily, weekly, and monthly reports and cost sheets." I have never heard of nor seen any system of cost-keeping that would automatically supply the 'personality' of a successful manager. If it did, what would be the use of having a high-salaried manager when a cheap bookkeeper or clerk could do the work. In fact, I have seen few clerks who could install a successful cost-system, but they can often keep it in operation after it has been started. I myself have found it more difficult than designing, as it involves so many unknown quantities. The cost of maintaining such a system is slight, and it is almost the universal opinion of managers that it is a great help in managing a mine and helping to reduce the costs. So to speak, it places a 'boss' over each individual man and cuts out the necessity to work 'like blazes' when the boss is around, so as to be able to fill a pipe and 'swap yarns' when he is out of sight. It is a great help to keep up the output of individuals. It cuts down the expense of superintendence, often more than enough to pay its cost. It prevents padding the pay-rolls. It makes it absolutely necessary for the mine to keep the machines and tools in the best shape and to keep them moving, as any falling off from this source or any other will be quickly discovered. It enables the manager to analyze his expenditures with a view to improving his foremen, laborers, and plant, and it helps to determine a fair unit-price for similar work in the future. Great care should be exercised in using published cost-data unless the conditions are known. Lastly, it enables the manager to know early each day if his work for the preceding day has been carried on at a profit or a loss. If he knows he is running behind at the time he is doing it, he will have opportunity to improve conditions before they have gone hopelessly bad.

The records that the workmen or foremen have to keep should be very simple and involve practically no calculating. It will be found to be an advantage to have a printed blank on which to punch or check off the quantities as far as practicable. Most of them do not like to do much figuring. Most all the calculating should be done in the office by the cost-clerk. This last position is one of the most desirable for a young engineer who wants to get the run of the work. If I am not mistaken, it used to be that anything outside of assaying, surveying, or draughting was beneath him, but now almost everybody recognizes that the commercial work, as a preparation for managing, is as important as any.

CHAS. KIRBY FOX.

Pomona, California, July 27.

Copper converters are universally side-blown, since bottom-blowing would oxidize the metallic copper before the oxidation of the matte was complete. Furthermore, the high specific gravity of the copper would require a higher air-pressure if the full head of molten metal in the converter had to be overcome.

In a new French Welsbach mantle, the rare oxides are consolidated in an electric furnace, greatly increasing resistance to shocks, tremors, and draughts.

RECENT CYANIDE PRACTICE IN KOREA.

Written for the MINING AND SCIENTIFIC PRESS
By A. E. DRUCKER.

The Oriental Consolidated Mining Co., with works situated in northwestern Korea, is now operating a total of 220 stamps, crushing about 30,000 tons of low-grade ore per month. There are five stamp-mills and four cyanide plants, scattered over the concession, using different methods of cyanide treatment, the most recent being the method employed at the Candlestick mill. The cyanide practice here is somewhat unusual and a detailed description may prove interesting.

At Candlestick the Company has a small mine that will produce 20 to 30 tons of $20 ore per day. The ore consists mainly of quartz, and contains from 10 to 20% of sulphides, including iron pyrite, zinc-blende, and galena. Unlike the other ores on the concession, there are no serious obstacles to cyanide treatment, such as the presence of arsenical pyrite, marcasite, and stibnite. The former two oxidize readily in moist air with the formation of ferrous sulphate, which decomposes cyanide, and also acts as a de-oxidizer, absorbing oxygen from the cyanide solutions. The ore is free-milling to a large extent (70 to 75% of the gold being amalgamated on silvered copper-plates). The greater part of the gold, however, is in a fine condition. There is an abundant supply of water for milling purposes throughout the year. Power is an inexpensive item, for both wood and water are plentiful, and close at hand.

After performing experiments on a practical scale at the Taracol test-plant I decided that the most economical form of treatment for such an ore would be to crush with stamps, and use inside and outside plate-amalgamation, followed by direct cyanide agitation of the total tailing, with decantation and vacuum-filtering. Preliminary concentration before cyanidation is omitted.

The mill consists of one 7 by 10-in. Blake crusher, 10 stamps weighing 1050 lb. each, and two standard 10-ft. silvered copper-plates in three sections, with drops of 1¼ in., and a grade of 3 in. to 1 ft. For inside amalgamation there are two plates, both back plate and chuck-block. Also there is included a clean-up pan, and all necessary appliances that go to make up a modern 10-stamp mill. Concrete mortor-blocks, built on solid granite, constitute the battery foundations. All anchor-bolts are so arranged that at any time a broken one may be readily removed, and a new one substituted. A detailed design of the battery is given in this article.

The cyanide annex consists of four pyramidal pulp-thickeners, 7 by 7 by 5 ft., four mechanical agitators with plow-shoes, and vacuum-filters, 10 by 15 ft. diam., four sand-filter clarifying tanks, 6 by 12 ft. diam., six eight-compartment zinc-boxes, and three sumps, 10 by 15 ft. diam. There are three separate pumps, one for aerating, another for vacuum-filtering, and a third for pumping solutions. For the clean-up there is one small acid dissolving-tank, 5 by 3 ft. diam., with hood for disposing of short-zinc, one vacuum-filter precipitate-box, 6 by 7 by 5 ft., and one wash-water settling-tank, 6 by 8 ft. diam. In addition to the above equipment there is a separate room for retorting, melting, and roasting. A small assay and chemical laboratory is also supplied.

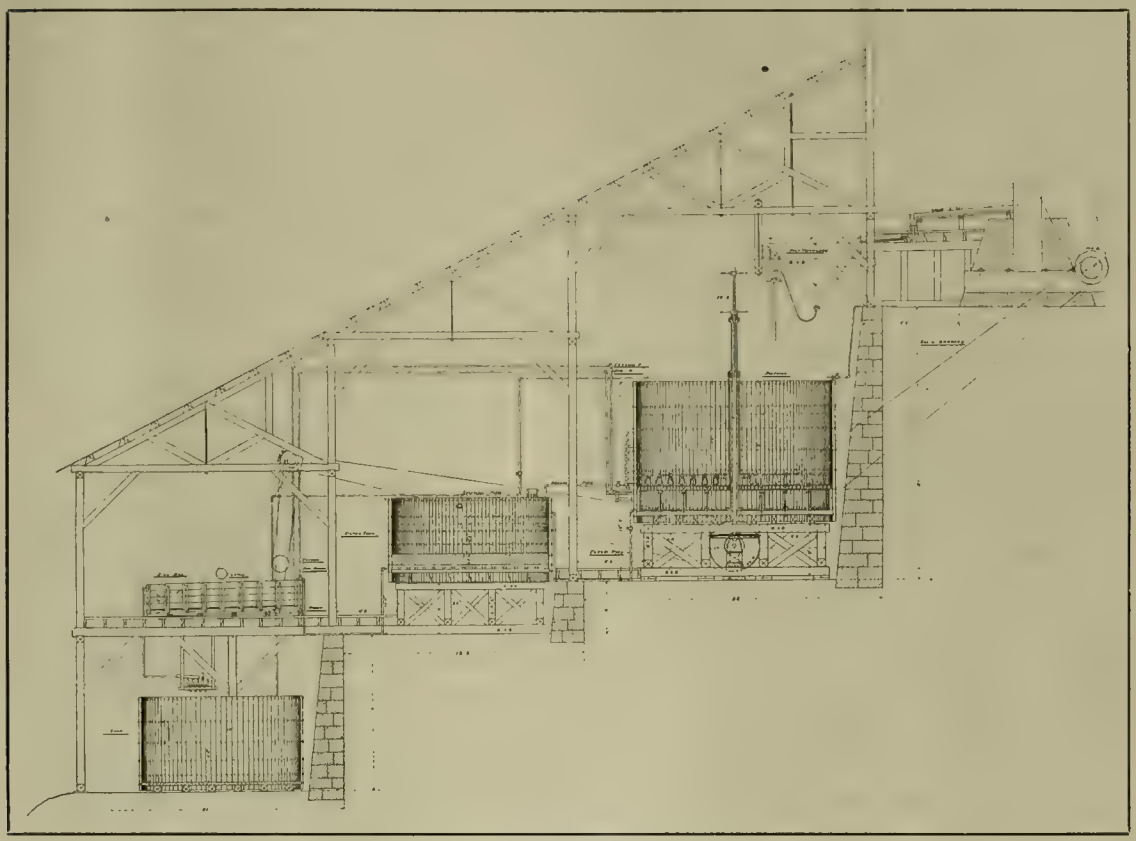
The ore on arriving at the mill is weighed, sampled, and dumped onto a grizzly; the undersize passing to the bin, the oversize to the Blake crusher. It is intended that the ore as it is fed to the mortars will pass a 1-in. ring. For crushing and inside-amalgamation we are using a 50-mesh diagonal burr-slot screen. These are of a special 'Duro' steel, and are proving very satisfactory. An 8 to 10-in. discharge, and 8-in. drop, is used at 95 drops per minute. The inside (chuck and back) copper-plates are ¼ in. thick. The pulp on discharging from the mortar drops onto a copper splash-plate, and thence onto the lip. From the lip-plate is a drop of 2 in. to the main plate, which is cut in equal sections with 1¼-in. drop to each. I find that a 4 by 8 by 10-ft. plate, cut into three equal pieces, is easily taken up and prepared for silver-plating. The splash-lip and outside plates were given a good heavy plating of 2½ to 3 oz. silver per square foot at our plating plant. The 1¼-in. drops on the outside plates are the proper thing, for at these places are the main accumulations of amalgam. These plates when newly plated were 'spongy' (not too compact), and absorbed a large amount of quicksilver at the first dressing. It would take some little time before the plating would cease absorbing the mercury. The deposit was slightly rough and surely was a benefit to amalgamation. A hard compact plating, such as that on tableware, will not absorb nearly the amount of quicksilver, and does not give as good an amalgamating surface. Plates are dressed four times during 24 hr., no cyanide being used. The amalgam on the lower plates is kept at the consistence of putty, while at the splash and lip it is a little harder. 'Quick' is fed every hour to the mortar, the amount being regulated by the richness of the ore. Naturally the lip serves as an indication of what is being done inside, and also acts as a guide to the proper amount of mercury to feed. Both plates are adjustable to grade and we find, with this ore, about 3 to 4 in. to 1 ft. about right. There is a trap at the end of each table. The stamp-duty is 2½ tons per 24 hr. Amalgamation at the present time on this ore gives a saving of 60% inside the mortar, and 15% on the outside plates, a total saving of about 75% of the gold with $20 ore.

The pulp from the plates passes directly to three pulp-thickeners. The clear overflow either flows to waste, or is saved when water is scarce for milling purposes, and the thick underflow passes to an agitator.

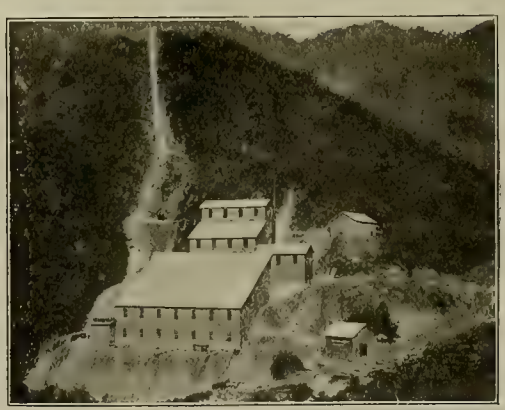
The thickened pulp discharges from a ¼-in. outlet, the pressure-head being 30 in., and the pulp can be diverted to any of the four agitators by a simple slide-adjustment in the launders. At the battery the consistence of the pulp is about 1 to 7, which gives the best results in the pulp-thickeners when a 1 to 3 pulp is required for the agitators. The thickeners are adjusted so as to take about 12 to 14 hr.

to fill one 15-ft. agitator 8 ft. deep. When an agitator is full it contains a charge of about 12 to 15 tons of pulp. While filling, the muller is kept in motion, so as to uniformly distribute the pulp, and if it should be desired to thicken the charge within the agitator so as to make room for a larger charge without stopping the agitator and decanting water, then, while in motion, clear water can be drawn from beneath the filter and run to waste. After the agitator has received a full charge, the agitation is stopped, the muller raised above the settled pulp, and all allowed to settle for 5 hr. However, before stopping the agitator, 8 lb. lime per ton of ore, mixed with hot water, is added to a 12-ton charge and thoroughly stirred for a few minutes. Lime mixed with hot water forms a milk-of-lime, and is very effective for settling purposes. Decantation takes place as soon as the pulp begins to settle, and I find that time is gained by following the pulp down as fast as it settles. It will take longer for a charge to settle if one waits 3 or 4 hr. before starting to decant. Upon completing this operation and at the end of five hours the settled pulp should contain about 40% moisture. Next the muller is lowered and set in motion until the plow-shoes barely scrape the filter, and at this point the muller is clamped, the vacuum applied beneath the filter, and the charge allowed to filter for two hours. When the vacuum-filtering is complete the pulp will contain from 18 to 20% moisture. What little water remains will not dilute the cyanide solutions to any extent. The charge is now ready for cyanide treatment, which occupies 28 hr. out of a total of 48 required to complete the cycle of treatment.

Strong cyanide solution (0.20% free-double cyanides) is next pumped onto the charge until the agitator is nearly full, while at the same time a muller with plow-shoes is being revolved at 18 r. p. m. The muller is lowered so that the points of the shoes barely touch the filter. Every charge receives a 10-hr. agitation and aeration. When aerating, air is forced beneath the filter and bubbles up through the charge. Aeration and agitation are perfect at every point of the vat. After this operation is



Candlestick Cyanide Agitation Plant.



Oriental Consolidated Mining Co.'s Mill.

finished the agitation is stopped, the air turned off, the muller raised above the settled pulp, and all allowed to settle for a short time. The solutions are sufficiently alkaline, and absorb enough lime from the previous operation to cause the pulp to settle readily, therefore, no lime is added to any of the washes to follow. Next comes the decanting of the strong cyanide-gold solution, which can be done to within 40 to 45% moisture remaining with the settled pulp. Decanting begins as soon as possible after the pulp begins to settle and takes about four hours to complete.

It is not necessary to wait until the solution becomes perfectly clear before decanting, since it is run to sand-clarifying vats and from there flows as clear as crystal to the zinc-boxes. These clarifying-vats also serve as gold-solution storage-vats, so that the flow to the zinc-boxes can be regulated. Within each of these vats is a burlap filter and on top of each is one foot of clean coarse quartz sand. If the solution to be decanted is slightly cloudy all the slime therein will form a thin layer on top of the sand, and is removed with a scoop every three or four days. The slime does not seem to penetrate the sand readily. The pulp remaining within the agitator contains from 40 to 45% moisture in rich gold solution and is next vacuum-filtered down to within 20 to 25% moisture. The agitator is set in motion, and the muller gradually lowered through the pulp until the plows just begin to touch the filter. The shoes revolving next to the filter, prevent any slime-cake from forming, and when the suction is started beneath the filter, the gold-bearing solution is gradually sucked through into the compartment below. Before starting the vacuum the slime, containing 45% moisture, is quite thin and agitates readily, there being no trouble in lowering the muller when the plow-shaped shoes are attached. With a good strong suction beneath the filter the time required to bring the charge down to 25% moisture is about two hours. The pulp with 25% moisture is very thick and sluggish toward the last, but it is possible to filter down to 20%. A total of 6 hr. is required for decantation and vacuum-filtering.

After the removal of the strong solution there follows a 0.10% KCy wash, assaying a trace in gold, which is thoroughly agitated for a few minutes, settled, decanted, and vacuum-filtered. Lastly, a weak barren 0.05% is applied in the same way, and upon the completion of this operation the extraction of the gold-bearing solution is practically complete. The charge is now ready to be run to waste. A little water is added, the discharge-hole opened, and the revolving of the muller will empty the agitator. A final water-wash is not necessary and consequently there are no waste solutions of any apparent value. Both washes have their separate storage and clarifying-vats; they are run through their respective precipitation-boxes to corresponding sumps. I find that with the weak wash, precipitation is very unsatisfactory. If much lime is added for settling purposes, a gray coating on the zinc is formed, and in time this entirely prevents a precipitation of the gold. For this reason no lime is added to the washes. Sufficient lime for settling purposes seems to be absorbed from the first addition (8 lb. per ton of dry pulp) or what remains with the pulp after extracting the water. This coating is very hard to remove by simply scrubbing the zinc, and I have found an easy way of removing it is to dip the zinc in a very dilute sulphuric acid bath when required.

The cyanide treatment may be summed up as follows:

	Hours.
Filling	12
Extraction of water from pulp:	
Settling and decanting	5
Vacuum-filtering	2
Cyanide agitation and aeration	10
Extraction of strong solution, 0.20%:	
Settling and decanting	4
Vacuum-filtering	2
Medium wash, 0.10%:	
Settling and decanting	4
Vacuum-filtering	2
Weak wash, 0.05%:	
Settling and decanting	4
Vacuum-filtering	2
Discharging and sampling	1
Total	48

Probably a short explanation of my combined agitator and vacuum-filter would be proper. All details of construction will be found in the drawings appearing in this article. The muller has four arms at right angles to each other, and to them are attached 26 cast-iron plow-shoes equally spaced. The shoes on opposite arms are arranged to work in between.

The burlap filter is well braced 24 in. from the bottom, and can neither bulge one way nor the other under pressure or vacuum. As a protection to the burlap one-inch boards bored with inch holes are placed on top and well spiked. The filter-cloth is between, and the holes above should coincide with those below in order to get results. The capacity of this 15-ft. agitator is 12 to 15 tons of dry pulp, and it requires about 5 hp. to run it. The heavy pulp, when once in motion at 18 r. p. m., takes very little power. The muller can be easily raised or lowered 2½ ft. An agitator of this type is particularly adapted to the treatment of the total product from the mill-plates, both sand and slime together. There is never any trouble to start or work down a charge after it has settled compactly. With this arrangement a separate vacuum-filter plant is not needed. All the different operations of collecting, agitating, aerating, decanting, and vacuum-filtering are performed in the one vat, and therefore the method requires a plant of the smallest size. The consumption of cyanide is about 1½ lb. per ton with this heavily mineralized ore, keeping the solutions at 0.20% free KCy plus double cyanide, with a protective alkalinity of about 0.5. The plant has now been in successful operation for several months. The mill 'heads' average $20 per ton, the plate tailing $5, and the cyanide tailing about 60c. gold, or a total extraction of 97%. The total cost of treatment is about $1.50 per ton, with the prospect of this being somewhat reduced in the future.

AN ASSAY-PLAN.

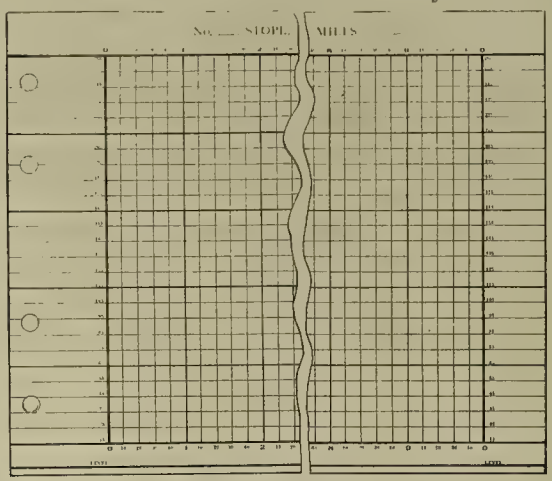
Written for the MINING AND SCIENTIFIC PRESS
By L. F. S. HOLLAND.

To those having charge of the operation of metalliferous mines, readily obtainable and exact information as to the value of the ore, and the daily segregation of costs in all departments, are of first importance. As to the value of the ore, the money received for the products sold will of course show the actual cash value of the ore treated. Few ore deposits are, however, so homogeneous in valuable content that the selection or rejection for mining of parts of the deposit will not considerably affect the 'profit and loss account.' To ascertain which ore to select, careful and systematic sectioning and sampling, and the plotting of the results of the assays of the samples, are generally essential.

For workings of large extent, such as those on the Smuggler-Union vein, near Telluride, Colorado, which is operated through several miles of levels, an 'assay plan' on a scale of even 100 ft. per inch would, on a single sheet, be so large in size, yet so crowded with the plotted assay results, as to be impracticable. The continuous stope-sections on long folding sheets, in use at some of the mines of the Rand, overcome this difficulty in a measure, but are inconvenient in several respects. In my work in the mines of the Smuggler-Union Mining Co., I have evolved and have had in use for several years a plan that has proved convenient to handle, simple to plot, and able to reveal at a glance the location, value, and width of vein represented by the samples assayed. By means of this plan it is easy to compare one section of the mine with any other. Sheets of good ledger paper of suitable size are filed in a loose-leaf binder, on the principle of the loose-leaf ledgers so much in vouge. The binder can be made with a lock, if desired. When the book lies open, the left-hand leaf has its 'post' holes punched in the right-hand margin of the sheet, and the right-hand leaf has holes punched in the left-hand margin. The sheets are ruled and printed on one side only, to suit the particular mine the assay-plan refers to. Movable index 'tabs,' with clutches slipped over the edges of the leaves, mark the various stopes or levels.

The accompanying diagram shows a portion of a right-hand page of the assay-plan of the Smuggler-Union mine before anything is plotted on the sheet. The leaf is 24 in. long by 12 in. wide. The line at the bottom represents a level, and the proper number of the level is written in front of the word 'level.' A line is ruled across the page to correspond with the top of the stope, that is, the level above. In the Smuggler-Union mine the levels vary from 100 to 250 ft. apart. On this plan, each of the large squares, which are ruled in red ink, represents 50 ft. square on the vein, the scale being 25 ft. per inch. Each of the small squares, which are ruled in faint blue ink, represents 10 ft. square. In mines where stoping ground is figured by the fathom, it is convenint to have these smaller squares represent fathoms.

In the Smuggler-Union mine the ore-chutes or 'mills' are 50 ft. apart, and are numbered consecutively from south to north. These mills are designated on the assay-plan by writing the proper figure in front of the black-face figures at the top and bottom of the page. The figures 10, 20, 30, 40, between the numbers of the mills represent so many feet north of a particular mill. The numbers in the left and right-hand margins represent so many feet up from the level. In this plan each page represents 500 ft. in horizontal distance along the vein, and each opening of the book represents 1000 ft. As the sheets are removable, one section 500 ft. long can be readily compared and correlated with another. For facility of reference it is found advantageous in plotting the assay-results on this particular plan to enter the gold values in red ink, the silver in blue, and the widths, descriptions of vein partings, and other items in black. The location and stoping value of defined ore-shoots can also often be more clearly indicated



Loose-Leaf Assay Record File.

on the plan by the use of colored inks, assigning a certain stoping-value, or lack of value, to a certain color. In calculating the stoping-value of an ore-shoot, the geometrical mean of the figures, with due allowance for the widths sampled, as well as the assay-values, should of course be taken.

Nickel in ores, even if Co, Fe, or Mn may be present, can be separated by a method devised by Pozzi-Escot, as given below. In a solution of the ore alkaline-earth metals are first separated by the use of $(NH_4)_2SO_4$ solution. The filtrate is then concentrated, and to it is added a large excess of $(NH_4)_2MoO_4$ in saturated solution, and also some NH_4Cl. This mixture is heated to 80 or 90°C. for some minutes, then stirred frequently for an hour until cold, the cooling being preferably effected by use of ice. All of the Ni is thus precipitated as nickel ammonium molybdate together with most of the iron. Filter, wash with NH_4Cl (sat. sol.) and separate Fe by NH_4Cl with NH_4OH. In the filtrate the Ni can be separated for weighing by any one of many known processes. Grossmann and Schuck (*Bull. Soc. Chim.* [4], III., 14) assert that the reaction (which is not new) does not cleanly separate Ni from Co, some insoluble compounds of Co being always formed. Hence it is inapplicable as a test for Ni in Co salts, or in the presence of that element.

THE SILVER VEINS OF THE MONTREAL RIVER DISTRICT, CANADA.

Written for the Mining and Scientific Press
By Alfred Ernest Barlow.

*The mineral occurrences in the Montreal River district above Bay lake may be considered as belonging to three distinct areas, namely, the Maple mountain, the James township, and the Bloom lake area. The Maple mountain area consists of a comparatively narrow and irregular intrusion of diabase, occurring to the northwest of Lady Evelyn lake. This mass of diabase extends, with almost unbroken continuity, from the vicinity of Anvil lake northward for nearly nine miles to a point a little east of Boucher lake, near the dividing line between Banks and Speight townships. The outcrops of this diabase vary in width from about a quarter to half a mile, flanked on either side by an arkose, or coarse-grained quartzite, through which it is intruded. The James township area is very much more extensive, including parts of the townships of James, Smyth, Tudhope, Mickle, Farr, and Willett, and embracing what are generally known as the Silver Lake and Hubert Lake districts. The total area in these townships underlaid by the silver-bearing diabase is very nearly 40 square miles. The Bloom lake area is confined to a mass of diabase outcropping in the region to the west of a chain of lakes of which Bloom lake is the largest. The Bloom lake diabase is a mass of irregular outline, with a length of about 10 miles and a width varying from half a mile to nearly 2 miles. The region in the vicinity of James township is much the most important of these mineral areas, for it not only far exceeds the others in extent, but also in the comparative richness of the deposits. At present there are two methods of ingress to the district. The land or winter route commences at Earlton, on the Temiskaming & Northern Ontario railway (26 miles north of Cobalt), and crossing the northern parts of the townships of Armstrong, Beauchamp, Bryce, and Tudhope, reaches Elk lake (Elk City) opposite the mouth of Bear river in the fifth concession of James township. This road is about 30 miles long, 7 miles of which has been already constructed as a wagon road.

Two rival towns, situated on either side of Elk lake (an expansion of the Montreal river), have already sprung into existence, the tents which formed the first residences having now given place to more substantial log structures. Elk City, as the townsite on the northeast bank of the river has been called, already contains a comfortable hotel and several stores. On the opposite side of the stream, at the mouth of Bear river, the Ontario Government has surveyed a town plot which they have named Smyth.

All of the orebodies in the several mining areas mentioned occur in the form of veins cutting a quartz-diabase or gabbro. Most of the veins in James and surrounding townships occupy two sets of fissures, running approximately north and south and east and west respectively, and therefore nearly at right angles to one another. These fissures are regarded as contraction-cracks formed by the cooling laccolith, which have been filled by later and more acid secretions of the same magma from which the accompanying diabase has solidified. The vein-filling must therefore be regarded as of pegmatitic origin, having the same genetic relationship to diabase that ordinary pegmatite does to granite. For purposes of discussion and correlation, it may therefore be referred to as diabase-pegmatite in preference to the term aplite, by which the material in these veins or dikes is now known to the prospectors of the Montreal River district, for the latter would imply the formation of this material as a differentiation product of granite. As a rule these veins are more or less irregular, often curving, sometimes faulted, but surprisingly persistent over long distances. The fissures which they occupy vary from a fraction of an inch, or a mere crack, to 2 ft. or even more in width. Very frequently, too, the same vein may show an equal variation in width both in its horizontal and vertical extension. The narrow veins, especially those from 4 to 8 in. wide, are more commonly met with, and are as a rule more richly charged with the desirable metallic minerals. The wider veins usually contain these either in fairly uniform and continuous, though in comparatively narrow streaks, or in wider and larger, though more or less isolated patches. Many of these veins possess quite sharp and distinct boundaries, the gangue material showing very little if any connection with or transition into the wall-rock. In some instances also the vein along either or both boundaries breaks easily and freely from the accompanying country rock, the orebody in such cases showing quite sharp and regular hanging and foot-walls.

In other and quite frequent cases precisely similar veins show a distinct and, at times, perfect gradation or passage into the surrounding diabase, such a transition being characteristic of either or both walls. Examples are not lacking, especially in the wider occurrences, where there is a pronounced commingling of the material of the vein and the parent plutonic rock. In such cases the vein may contain certain vague greenish spots or masses, which have undoubtedly been derived from the diabase, and are now in an altered and disintegrated condition, while the diabase in the more immediate vicinity of the vein is relatively more acid in composition, with abundant quartz, and patches and crystals of the same acid plagioclases characteristic of the vein. Moreover, the minerals, which together make up the diabase, show rather pronounced decomposition due to the same eruptive after-actions as a result of which the accompanying veins have been formed. The plagioclase (labradorite) has been largely converted to a pale yellowish green saussurite, while the original pyroxene has been replaced by an aggregate of chlorite, epidote, and calcite.

The gangue of these veins, in their simplest form of development, shows a fine to moderately coarse-grained feldspathic material, varying in color from a pale pink to deep flesh-red. At first sight most of these veins are remarkable chiefly for the prevailing

*Abstract of a paper in the Bull. Can. Min. Inst., July, 1908.

absence or scarcity of quartz, although examples are not lacking of veins, evidently very closely related, which contain this mineral as an abundant and occasionally predominant constituent. G. A. Young, of the Geological Survey, made a microscopical examination of this feldspathic material. In the thin sections examined by him, representing several veins from the western part of Tudhope and the central part of James township, by far the largest proportion at least was plagioclase, varying in composition from albite through oligoclase to andesine. This diagnosis was corroborated in part by a separation of the mineral constituents by means of a heavy solution. The plagioclase thus separated varied in specific gravity from 2.609 to 2.635. Some of this plagioclase (albite) had distinct rectangular or lath-like outlines, showing twinning according to both the albite and pericline laws, which in certain cases produced a fine 'cross-hatched' structure, usually considered characteristic of the appearance of microcline between crossed nicols. Most of these grains are quite turbid. Another species of plagioclase (oligoclase) occurs in irregular, untwinned, and clear grains, thus resembling quartz; but, unlike quartz, this mineral is readily fusible. Some of these veins contain a considerable admixture of quartz, often forming graphic intergrowths with the feldspars. In certain of these cases, the feldspar has acted as the host, but in others, large grains of quartz were noticed containing only a few shred-like individuals of the plagioclase. Calcite is usually present and sometimes very abundant. This mineral frequently occurs in fairly large grains, or in granular aggregates made up of several individuals, disseminated through the more abundant feldspathic material. It also occurs in more or less continuous vein-like areas or masses, anastomosing between, and sometimes penetrating through, both simple and composite individuals of feldspar. Portions of the vein, where exposed to the action of the weather or percolating waters, frequently present a finely cavernous or sponge-like appearance, due to the etching and removal of the calcite, thereby leaving small and irregular shaped microlitic cavities lined with minute tabular crystals of feldspar. Oxidation of the iron sulphides usually present, gives a prevailing pale brownish to an almost black color to these portions of the veins. Not infrequently barite, usually pale pink in color, and occasionally celestite, occur with or replace altogether the calcite and feldspar. Some of these veins are, therefore, made up almost wholly of red feldspar, almost always a plagioclase near the acid end of the series, together with a very subordinate amount of calcite and a still smaller quantity of quartz. Other veins again are made up of an almost equal proportion of plagioclase and calcite and sometimes quartz, while still others present a finer-grained feldspathic portion in the vicinity of the walls, with the whole mass of the interior made up of comparatively coarse-grained calcite, with sometimes a small proportion of quartz. The stages represented completely by the vein occurrences in these districts show a perfect and practically uninterrupted continuity during their consolidation from an original condition of hydro-igneous fusion, characteristic of the magma from which the comparatively fine and even-grained feldspathic material is believed to have resulted, to conditions of igneo-aqueous solution which must have obtained in the viscous mass from which the latest calcite or quartzose segregations had solidified.

Chalcopyrite is the most abundant and common of the metallic constituents, but bornite is also frequently met; both of these sulphides often occuring side by side in the same vein. Covellite occurs, but much less frequently. Galena is common and usually carries silver. Many of the veins contain micaceous or specular iron ore and some of them are entirely made up of this material near the surface. Several veins are made up of alterations of chalcopyrite and specular iron ore, while frequently a vein containing specular iron is replaced at a depth sometimes of only a few feet by chalcopyrite, smaltite, and native silver. In the Hubert lake area veins of magnetite have been found, similar to those of hematite in the township of James. Malachite and azurite are common. The cobalt minerals, either smaltite or cobaltite are prevalent, usually in association with more or less nicollite. Erythrite (cobalt bloom) and annabergite (nickel bloom) are also frequently present as surface decomposition products. The smaltite-nicollite veins often contain the white bloom near the surface, which is formed by the reactions of these minerals upon one another when subject to weathering processes. Most of these veins will give assay values in silver from a fraction of an ounce to 30 oz., or even more, per ton, although the material on which the trials were conducted showed no signs of the native metal. Silver is of common occurrence in these veins, both in the native state and as argentite (sulphide of silver). As native silver it occurs in nuggets of various shapes and sizes, as well as in fine flakes and scales disseminated through any of the various gangue minerals, feldspar, calcite, barite, or quartz. Beautiful fern-like skeleton crystals of native silver are frequently found in certain cavities in these veins from which the enclosing calcite has been removed as a result of weathering. The mode of occurrence and association of the silver in some of these veins bears a striking resemblance to that obtaining in the veins cutting the diabase in the vicinity of Kerr lake near Cobalt. All of these veins occur in diabase or gabbro, a rock which represents the consolidation of a lava of basic composition, which has been intruded in the form of sills or laccoliths and dikes through rocks of Huronian, Keewatin, and Laurentian ages. The rocks representative of the Huronian are conglomerates, slates, and arkoses or quartzites, similar in structure and mineralogical composition to rocks of the same geological age found in the neighborhood of Cobalt. No rocks of Keewatin age have been found in James township, but extensive outcrops occur in the central and eastern portions of Tudhope township. The Keewatin is intruded by certain granites and gneisses which are usually referred to as Laurentian. These two rocks form an igneous complex lying unconformably beneath and furnish-

ing pebbles and other detrital material of which the basal conglomerates of the Lower Huronian are composed. The diabase or silver-bearing formation is the newest rock in the district, as it is intruded through all the other series, cutting even the arkoses and quartzites, which are at the summit of the sedimentaries. All of the veins of economic importance so far discovered appear to be confined to this diabase, which is essentially similar in mineralogical composition and geological age to that in which occur some of the most productive silver veins of the Cobalt district.

The hand specimens usually show a dark green, more rarely grayish, medium or coarse-grained rock, made up of irregular prisms or grains of a dark-green mineral and a dull, light greenish feldspar, showing only an occasional cleavage-face. One of the least altered of these specimens was obtained from the Miller location in the western part of Tudhope. Under the microscope the rock proved to be a rather coarse diabase, considerably altered, but with its typical mineralogical composition and structure still distinct. Originally it appears to have been composed of nearly colorless pyroxene, occurring in large and small often twinned, but shapeless plates penetrated by laths of plagioclase. These individuals of feldspar are twinned according to the albite law, unaccompanied by carlsbad twinning or zonal structures. They vary greatly in size, the interspaces being filled with irregular grains of quartz, which mineral forms no small proportion of the rock. A few flakes of deep brown, highly pleochroic biotite are also present. Much of the feldspar, often in the central part of the individuals, is completely altered, apparently to epidote, while the pyroxene is associated with secondary minerals including a pale-green somewhat fibrous hornblende. The rock shows no abnormal characters and may be described as a somewhat decomposed quartz-diabase. Another specimen from a claim in the northwest corner of Tudhope appeared to represent a diabase, although the original pyroxene has been completely removed. The part of the rock represented by the slide is largely composed of tabular individuals of plagioclase sharply idiomorphic and with much interstitial quartz. The plagioclase shows prominent albite twinning, sometimes accompanied by carlsbad twinning, and in two such cases the values of the extinction angles indicated an acid labradorite. The interstitial quartz in many instances almost seemed to be replacing the feldspar, isolated shreds of which sometimes lie in the quartz or form skeleton-like aggregates similarly orientated. Occasionally the relations are reversed, and the feldspar then includes a number of separate grains of quartz in optical continuity with one another. No evidence was afforded that the quartz was of more than one generation; and because of the general occurrence of this mineral in the unaltered diabase of the district it was concluded that the quartz was original. Besides this feldspar and quartz, calcite and chlorite compose a considerable proportion of the section. The chlorite occurs in small aggregates between, or distributed through, the feldspar. The calcite forms plates and granular aggregates. Both these minerals appear to replace the original pyroxene.

To summarize the conclusions, then, the diabase of the Maple mountains, James township, and Bloom lake areas is essentially and prevailingly a quartz-diabase. In many instances this quartz occurs as a granophyric or graphic intergrowth with the plagioclase, which is usually an acid labradorite. The presence and usual abundance of this original or primary quartz marks the rock as a rather exceptional type and district from ordinary diabase, which as a rule contains little or none of this mineral. Diabase and similar basic igneous rocks have been artificially reproduced in the laboratory from a state of simply dry fusion; but it is extremely doubtful whether any extensive intrusive process produced by natural causes is ever unaccompanied by a greater or less abundance of superheated water as an integral portion of the fused mass. This condition of dry fusion, however, is distinctly approached in a magma from which an ordinary diabase has been formed. During the intrusion and subsequent solidification of the diabase described in the present paper, however, there has been a very general superabundance of these heated waters and vapors, which not only accompanied the crystallization of the great mass of the ordinary parent plutonic, but were especially present and active in the formation of the pegmatitic mineral veins which represent the expiring efforts of this intrusion. The presence of the abundant original quartz, often in graphic intergrowth with the plagioclase and the breaking down and replacement of the original pyroxene by chlorite and calcite, is distinct evidence of the presence of superheated waters and steam present in and traversing the ordinary or finer-grained phases of the diabase. The rock is, therefore, more highly quartzose than usual, which fact accounts in the main for the presence of the associated mineral-bearing veins. The presence of these veins in the several mining districts mentioned is due primarily to a profound fissuring of the diabase itself, formed probably as a result of the contraction of the rock in cooling, the resultant cracks and cavities being occupied in many cases as fast as they were formed by the later, more acid, and hydrated segregations from the same diabase magma. The veins in their simplest forms of development are, therefore, essentially of pegmatitic type, although some of the more complex types and those at the other extreme made up almost wholly of calcite or quartz show little or no evidence of such an origin. The various stages in the formation of these veins are completely represented in these mining areas, showing a perfect and practically uninterrupted continuity during their formation from an original condition of hydro-igneous fusion characteristic of the magma from which the comparatively fine and even-grained feldspathic material is believed to have resulted, to conditions of igneo-aqueous solution which must have obtained in the viscous mass from which the latest calcite and quartzose segregations have solidified. The feldspar in this diabase-pegmatite is essentially a plagioclase near the acid end of the series, chiefly albite and

oligoclase, but sometimes andesine, in contradistinction to ordinary or granite-pegmatite which contains orthoclase, microcline, and microperthite as the predominant and characteristic feldspar. Quartz is not essential and some of the more representative types of this diabase-pegmatite in these veins contain less than 5% of this mineral. Calcite is almost invariably present, and in extreme phases, or those which have been formed as a result of pronounced secondary action, completely replaces the feldspar.

The age relations of the mineral constituents of the gangue are fairly simple, although the several minerals constantly overlap in their periods of generation. Plagioclase in the main, the oldest or first mineral to form, is succeeded by calcite, and this in turn by quartz, although much of the calcite and even quartz was formed simultaneously with or even before some of the plagioclase. All of the gangue minerals, plagioclase, calcite, quartz, and even barite and celestite as well as the various metallic minerals, appear to have been derived from the surrounding diabase. The calcite has probably been derived from the decomposition of the original pyroxenic constituent, as much of the plagioclase shows little or no signs of alteration. The native silver is not only present in association with all of the gangue minerals already mentioned, but is common, and is sometimes abundant, in the diabase forming the wall-rock.

SMELTING WORKS AT RIO BLANCO, PERU.

Written for the MINING AND SCIENTIFIC PRESS
By AN OCCASIONAL CONTRIBUTOR.

The smelter of the Peruvian Mining, Smelting & Refining Co., which has just been blown in at Rio Blanco, Peru, is the second great enterprise inaugurated under American auspices, with American capital, in that country. It has begun its career with a first-class installation, under the best engineering advice, and is conducted under the management of men of high training and experience. The Company was organized in the United States by A. F. Holden, E. A. Clark, W. H. Coolidge, L. Vogelstein, E. A. Wiltsee, and J. L. East, and incorporated under the laws of the State of Maine on July 16, 1906, with a capital of $5,000,000 gold, the object being to exploit mines in Peru and to build a smelter, which has but recently been completed. The Company's main office is in Boston, its president being A. S. Hight and its treasurer S. E. Farwell. The Peruvian representative is J. L. East, who is general manager, with S. C. Hazleton as smelter superintendent, M. F. Church as constructing engineer, G. Wagner as mine superintendent, and A. A. Abbott as consulting engineer.

Copper Smelting Works, Rio Blanco, Peru.

The plant is situated in Rio Blanco and, as shown in the accompanying illustration, is in a deep gorge in the Andes. A comparatively level bottom affords an ample site for the works. The mountain walls

are almost precipitous on every side, but are nevertheless covered in many places by terraced gardens to a great height above the river.

The Ferrocarril Central del Peru gives communication with the port of Callao, as well as with the capital of the Republic, the respective distances being 135 and 120 kilometres. The same line also connects the smelter with the mining district of Yauli, which is 50 kilometres distant, where are the chief mines of the Company. By the same road connection is made with Cerro de Pasco.

The mines of Churruca, which are situated at the end of the railroad, are prepared to produce 200 tons of copper-ore daily, averaging 9%, with considerable silver and gold content. In order to be able to work to its full capacity the Company has bought the necessary ores in the districts of Yauli and Morococha, which are among the most important in the country. For this purpose it has signed contracts with the owners of the Gertrudis, Alapampa, Anacampa, Austria Duvas, and other mines, which can furnish a greater quantity of ore than is required by the capacity of the smelter. Ore can also be purchased in the district of Cerro de Pasco.

The smelting plant of the Peruvian Mining, Smelting & Refining Co. is designed to treat 300 tons of ore per day, producing a matte ranging from 50 to 60% copper, which it is planned to ship abroad for refining. Though the initial capacity of the plant is limited to the one blast-furnace already constructed, all necessary installations have been designed for fully double the tonnage, and provision has been made for the erection of a second furnace. The capacity of the plant can accordingly be increased to 600 tons per day as soon as conditions warrant, with but little delay. The blast-furnace is water-jacketed, and measures 44 by 186 in. at the tuyeres. It is housed in a steel building, the latter of double the necessary size, so as to provide for a second furnace. The flue for leading off the waste gases is situated behind the blast-furnace building. It is of brick construction, carried on steel columns, the bottom being hoppered for automatic discharge of the accumulated dust. Two large dust-settling chambers, built of masonry, intervene between the flue and the stack. The latter is of steel, 150 ft. high and 12 ft. diam. Directly beyond the flue on the feed-level are the ore, flux, and coke-bins, and the 'sintering plant.' The ore-bins have a capacity for 12,000 tons, and storage is provided for 600 tons of limestone and 300 tons of coke. The 'sintering plant' is designed for sintering fine ores so as to put them in a better physical condition for the blast-furnace, and consists of 12 pots of about 1-ton capacity each. It is estimated that 100 tons per day will be treated in these pots. Back of the ore-bins, on a level with their tops, are situated the assay office and sampling mill. The latter is equipped with Vezin automatic sampling machinery, and will handle 60 tons per hour. The main line of the Ferrocarril Central del Peru passes behind and above the sampling mill, and a spur-track therefrom, running on a trestle, serves for the receipt and unloading of cars of ore. Beneath the trestle are ore-bins for receiving the ore in the first instance. These discharge on a conveyor belt, which carries the ore to the sampling mill. From the latter the ore is distributed to the ore-storage bins and thence to the furnace. It will be noted that gravity assists in the handling throughout.

The power for operating the plant is derived from the Rio Blanco river. A pipe-line 40 in. diam. and about 1200 ft. long delivers the water to the power-house under an effective head of 120 ft. This gives approximately 500 hp. The installation of the power-house consists of three 35-kw. direct-current generators and one Root blower of 20,000 cu. ft. per minute capacity, all driven by Pelton water-wheels. The generators furnish electric current for lighting purposes, and for the motors used at the several points around the plant for driving machinery. A machine shop and blacksmith shop, office building, and dwellings for employees complete the installation.

A new reducer in fire assaying is described by C. A. Rose in *The Mining World*. It is quite well known that much annoyance is experienced in assaying highly silicious ores by reason of the contents of the crucible boiling over when argol or other carbonaceous reducing agents are used, and to avoid this it is necessary to start the fusion at a low temperature and heat gradually, although a crucible is not so liable to boil over if the fusion is started in a very hot muffle. Sometimes a cover of salt is used to prevent this boiling, but in that case the fume is troublesome in pouring, if the slag is decanted from the lead. This boiling is caused by the disengagement of carbon dioxide from the carbon in the reducing agent. If a fusion is made without a reducing agent it will not boil over. If a sulphide were used as a reducing agent no gas whatever would be produced from this source, since the metal would combine with the silica and the sulphur would be converted to sodium sulphate. This would have the double advantage of producing more quiet fusion and introducing a basic element into the slag. Probably the most convenient sulphide for this purpose is iron sulphide, which can be obtained free from gold and silver. This was tried with satisfactory results. Silicious ores that boiled badly when a 0.5 assay ton was fused in a 20-gm. crucible, using argol as a reducing agent, gave no trouble whatever when the assay was made in a 15-gm. crucible, with the same quantity of ore and iron sulphide used in the place of argol. According to the equation,

$$FeS + 4PbO = 4Pb + FeO + SO_3.$$

1 gm. of iron sulphide ought to reduce 9.4 gm. of lead. In practice about 9 gm. are obtained, so that the reaction is nearly quantitative. The following charge was used: 0.5 assay ton of ore; 80 gm. litharge, 20 gm. sodium bicarbonate, 10 gm. potassium carbonate, 3 gm. iron sulphide. The use of iron sulphide as a reducing agent is new, and it ought to appeal to those having sulphide ores to assay by the nitre method. Its use instead of argol saves about 15 to 20 minutes in time of fusion.

AIR-DRILLS AND THEIR EFFICIENCY.

Written for the MINING AND SCIENTIFIC PRESS
By SAMUEL K. PATTERSON.

Probably no branch of engineering development is on a par today with that of air-drill operation from the standpoint of inadequate efficiency. The introduction of the air-drill in mining and as an industrial factor for other purposes was a great step in advance and represented considerable progress in engineering development, but since that time air-drills themselves have made little or no progress in efficiency. Many of the ordinary facts or physical data essential for their operation are practically unknown, and this is due as much to the lack of adequate methods for their determination as to any other reason. Thus, even the question of what is meant by efficiency of an air-drill is debatable ground. The average manufacturer will say that it depends upon the initial air-pressure, air-consumption, and rate of drilling, but that no adequate or scientific conception of the same is possible or at hand. It is a generally accepted theory that air-drills in actual operation work best with an air-pressure of 80 to 100 lb. Some extend this to 150 lb. initial pressure. The air-consumption varies with the size of the drill, but for the average drill it is approximately 100 to 150 cu. ft. of free air per minute, compressed to 80 or 100 lb., taking the full supply available from an average 8 by 8-in. compressor. Until recently the speed of such drills, or the number of blows per minute, was variable and practically unknown, and the foot-pounds of the blow has been determined in rare instances only. No indicator diagram of the action in the cylinder has ever been made or is obtainable with the ordinary indicator on account of the inadequacy of this mechanism for such speeds, and because of the high corrective factor due to inertia and to the velocity of its parts. The action of the valves, and the effect of the port in reducing the air-pressure, are largely a matter of conjecture.

All drills for mining purposes can be divided essentially into two classes, those in which the valves operate by mechanical means imparted by the motion of the piston itself, and those operated by a differential air-pressure produced in various ways. The position of the valve is apparently determined largely by question of convenience in design from an operative and constructive viewpoint, rather than from the view of efficiency or air-consumption. The Ingersoll-Rand pneumatic hammers and drills have a valve operating by differential air-pressure at right angles to the motion of the piston, and installed in the handle of the device or at one end of the piston-cylinder. This necessitates comparatively long ports for the action of the hammer or drill during a portion of its stroke. The Rix pneumatic air-drill possesses a mechanically operated valve installed in a cylinder parallel to that of the piston proper, and possesses much wider ports and equally distributed passages. The McKiernan drill possesses features of both types, with a side valve-chamber operated by differential air-pressure. Other types are more or less similar, and the data herein given refers more especially to the average drill used in mining. Air-driven hammers, saws, augers, riveting machines, and a number of other devices, fall equally in this category, but their range is so wide, and their variability so great, that they have not been considered. However, all the conditions which hold in this particular type hold equally well in regard to the majority of air-driven tools where the frequency of the device operated is of such a character as to preclude the utilization of the ordinary appliances in their measurement.

The ordinary steam indicators as used in the indication of steam units, pumping machinery, ammonia and air-compressors, are inadequate as instruments of precision in this particular field. In fact, no satisfactory indicator for high-speed gas-engines is as yet available. Equal conditions hold in regard to high-speed steam engines, especially those direct-connected to electric generating units, and the necessity for a satisfactory indicating device where the problems of inertia and rigidity have been satisfactorily met for these speeds will undoubtedly prove as great a boon in the utilization of compressed-air as in the production of power by any kind of the high-speed engines. In regard to the action of compressed air in an air-drill it is assumed to be somewhat similar to that of steam in reciprocating-pump machinery. No cut-off exists in either type, and the pressure is supposed to be maintained more or less constant throughout the stroke. However, the use of indicators or pressure-gauges direct-connected to the cylinder of air-drills registers a fall in pressure of from 20 to 40% over that existing in the hose and valve-chamber, and whether this is due to inadequate size of ports or is in reality a measure of the average or mean effective-pressure is unknown. Only recently has this drop in pressure in the air-cylinder of the drill become generally known, and a more thorough study of the phenomenon is being undertaken.

Again it has been the generally accepted dictum among air-drill operators and superintendents that air-drills operate at a maximum efficiency of from 80 to 150 lb. air-pressure. That such drills should operate more efficiently at higher pressures is a reasonable conclusion if faults of design do not enter. It is also reasonable to assume, within certain limits, that a given drill should possess a maximum efficiency at a given initial air-pressure, due equally to details of design and operation. However, the statement that all air-drills are limited in their maximum efficiency, independent of design, to certain values in initial air-pressure is, if correct, undoubtedly due to faults in the design and operation of such types. The use of differential air-pressure in the operation of the valve, with this differential air-pressure obtained by allowing the direct ejection of a portion of the air into the atmosphere through an intermediate air-chamber at one end of the valve-piston, is not only an extremely wasteful device for the operation of the piston, but is an unnecessary one as well. It has also been the generally accepted conception of engineers that all drills other than compressed-air

drills have been tried and proved unsatisfactory. While undoubtedly this may be true under present conditions, that it is a necessary condition is by no means a foregone conclusion. The type of drill in which the air is compressed by electrical means in the immediate vicinity of the air-cylinder, to be used at once, represents a possible development along lines possessing considerable advantages. The condition of affairs may be summed up in the statement that our knowledge of operating conditions in the utilization of compressed air in the average air-drill, and in other air-drills, is essentially inadequate, and more complete information is highly desirable.

The average air-drill makes from 400 to 1000 blows per minute with an air-pressure varying from 50 to 100 lb. With increased air-pressure the number of blows per minute could undoubtedly be considerably increased, but such a result could be accomplished only by a change in the valve-device, utilizing the motion of the piston. The question of ports, their size and length, is a matter of vital importance in the operation of such drills, and the possibility of a suitable cut-off, with the object of diminishing air-consumption, is equally important. Again, the question of utilizing heat for re-heaters, with the object of diminishing the air-density and consequent air-consumption, has not been met in more than a tentative manner. Steam can be used in such types of drills in place of air, but is unsatisfactory for a number of reasons, and the utilization of air and steam combined is a question which is in an experimental stage of development.

Mechanical efficiency, however, is in reality a matter of minor significance in the operation of air-drills in comparison to that involved in a consideration of the factors affecting the commercial efficiency. Thus, the labor cost and other items are such in the operation of air-drills that the efficiency of a drill is measured in reality by the time of boring, and is practically independent of air-consumption in the choice of a type. The drill which has a small percentage-increase in the rate of digging can in reality consume several times the quantity of air in its operation and still be more efficient, on the commercial side, than the more efficient mechanical type in the actual operation of the drill itself.

A CONCRETE-BLOCK CHIMNEY.

A novel system of chimney construction, the invention of M. Dumas, of Brussels, is described in *Engineering News* of August 20. It has been covered by patents and is controlled by the firm of Léon Monnoyer et Fils, contractors, of Brussels. While the chimney is constructed of concrete blocks, reinforcement is used with it, and there would appear to be no difficulty in proportioning this reinforcement to the stresses to be sustained. It may be noted, also, that the vertical reinforcing rods are so placed as to be much less exposed to the interior heat than is ordinarily the case. The blocks are of large size, permitting rapid construction, and the provision for securing the taper in the chimney construction is particularly ingenious. The chimney is polygonal in cross-section, and may be built with 6, 8, 10, 12, or more sides, according to the size of the structure. The casting of the concrete blocks is illustrated in Fig. 1, which shows a cross-section of the block in the mold. As seen in the drawing, the cast-iron sides of the mold are in three pieces only, and the ends of the mold are formed by wooden stop-blocks. By adjusting the position of these stop-blocks, the length of the concrete block can be altered to suit the course in which it is placed; thus the taper of the chimney is secured without multi-

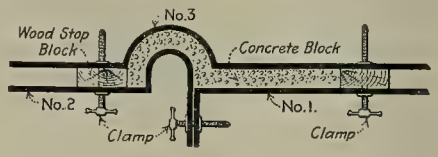


Fig. 1.

plying the number of molds. Fig. 2, which shows a partial cross-section of the chimney, will illustrate how, by varying the lap of the shank of the block past the semicircular lip of the adjacent block, the diameter of the circle is drawn in at each successive course. It should be understood that the blocks are reversed in direction in each successive course, so that the joints are properly broken. The largest blocks used are nearly 3 ft. long, and the distance across the semicircular opening is 6 to 8 in. The vertical reinforcing rods are placed in the semicircular openings.

To provide for circumferential reinforcement, there is placed on the bottom board on which the

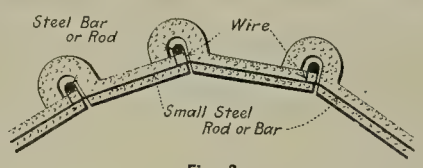


Fig. 2.

blocks are molded a wooden strip of triangular cross-section. This leaves a V-shaped groove in the block, in which a rod or wire may be placed for reinforcement. The blocks are usually about 10 in. high and the thickness varies from 6 in. for the bottom courses of the chimney to about 3 in. near the top. Rods are molded in the blocks for convenience in handling them. The large size of the blocks, and the fact that they are erected without scaffolding, enables the chimney to be constructed with a small working-force and with great rapidity. It is claimed also that the cost of these chimneys is less than that of chimneys made in any other way.

An alloy of aluminum and magnesium called magnalium is said to have greater strength than aluminum, inspite of being lighter, its specific gravity being about 2.5, while that of pure aluminum is 2.64. It can be forged like Swedish steel and worked like brass, giving a smooth surface of silvery color. It attains and maintains a high polish, and is unaffected by atmospheric agents. Magnalium can be soldered; its electric conductivity is 56% that of pure copper; the melting point is 1185 to 1250°F.; its specific heat is 0.2185.

Mine Reports.

WAIHI GOLD MINING CO., NEW ZEALAND.

The report for the year ending December 31, 1907, states that 356,974 tons of ore yielded £878,485 13s. 10d., the gross revenue being £888,585 1s. 10d. The expenditure in New Zealand and London amounted to £357,674 8s. 8d., leaving a profit of £530,910 13s. 2d., as against £502,073 in 1906. The four dividends absorbed £322,339 11s., as compared to £297,544 in 1906. A further bonus of 3s. per share, declared at the annual meeting, makes the total distribution 16s. per share, or 80% on the capital for the year.

In the mine the ore reserves are estimated to be 1,299,979 short tons, as against 1,029,658 twelve months earlier. The deepest shaft has reached 1020 ft. The ore comes from no less than 14 so-called 'reefs' or lodes. On the eighth level the orebodies have proved to be of great width, ranging from 50 to 92 ft., and in places as much as 75 ft. of the quartz assays over £10 per ton in gold and silver.

During 1907 the stamp-mills treated 28,108 more tons than in 1906. Seven tube-mills are in use. The gas plant proved a successful economy as against steam. The yield from the ore was £2 14s. 11d., as against £2 17s. 8d. in the previous year, but the working expenses were less. The mills are three in numbr and contain 90, 200, and 40 stamps, respectively. The duty is 3.794 tons per stamp; 5581 tons of concentrate yielded £140,480. Of the total yield of 1,332,621 oz., no less than 959,362 oz. came from the three mills and 373,259 oz. from the plant treating concentrate. Up to the end of 1907 this mine had yielded profits amounting to £2,871,327 on its capital of £500,000, in 15 years.

BROKEN HILL PROPRIETARY, NEW SOUTH WALES.

The 46th half-yearly report for the six months ending on May 31, 1908, states that the gross profit amounts to £30,388 and the net profit £22,776, as against £137,642 for the previous half-year. The profit was 1s. 8d. per ton of ore, as against 8s. 9d. during the preceding six months. Only one dividend (amounting to £72,000) was distributed during the period under review. The output of the mine was 273,557 tons, the nine furnaces at Port Pirie smelted 109,482 tons of ore and slime, besides by-products, making the total smelted 115,266 tons.

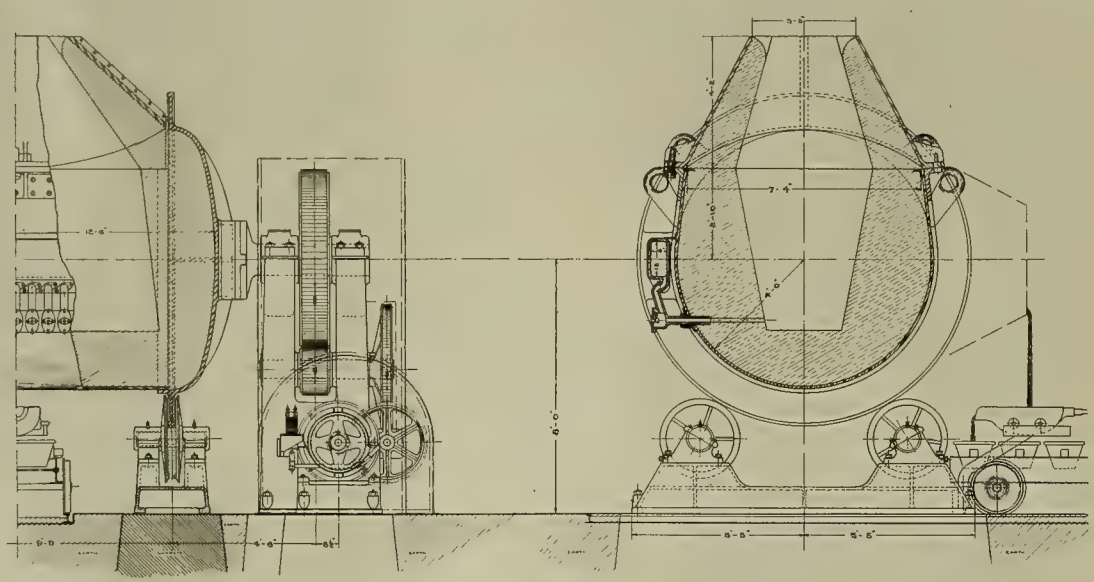
The financial results reflect the condition of the metal market rather than that of the mine. Silver, which on November 30, 1907, was at 2s. 2⅝d. per ounce, stood at 2s. 0 7-16d. at the close of the half-year; and during the same period lead receded from £15 18s. 9d. to £13 per ton. The deepest workings in the mine are at 1400 ft., and on that level the orebody is from 6 to 44 ft. wide. This ore assays 20% lead, 16% zinc, and 14 oz. silver per ton.

Improved Copper Converters.

By Herbert Haas.

The Union Iron Works Co. has recently designed new types of copper converters, which combine all the progressive improvements made in late years at the different copper reduction works in this country. One type is electrically operated and the other is a converter tilted by hydraulic pressure. These converters embody the following novel features of construction: The shells are of sheet-steel, and to permit of securing the lining, the parting-joint between the bottom and top portions is placed considerably above the centre, and both sides extend from the centre-line straight upward and slightly inward, at an angle of approximately 6° 45′, with a tangent normal to the centre-line. With this construction, the life of the lining is greatly increased, as the lining can be secured better than in the old converters, where the shell was parted in two halves and the sides of the upper portion were curved to the radius of the converter-shell. Rapid corrosion of this joint by the matte, a common defect in the old type of converter, is retarded by placing the joint of the two halves high above the centre-line.

The shells are riveted to spherical heads made of best open-hearth Bethlehem casting-steel, and are reinforced with heavy ribs. This form of head was designed to withstand the heavy stresses due to expansion and contraction produced by the high degree of heat, and to give the magnesite bricks or chromite blocks a good hold. These refractory liners are usually placed nearest the shells to prevent burning of the shells, should the silicious lining become completely eaten away through too prolonged blowing. The flanges of the heads form the riding-rings, which are of a diameter to permit of a complete revolution of the converter.



The bottom and top halves have heavy cast-steel angles riveted near the joint, which reinforce the shells and serve to connect the two halves, these being held together on each side by three large cotter-bolts. Cast integral with the steel angles, there is at each end of each plate a lifting lug, or eight lugs in all, the four lower lugs serving to lift the entire shell from its stand, the four upper lugs to lift the top from the shell.

Notable features are the construction of the wind-box independent of the tuyeres, and the provision of individual tuyeres. The tuyere-box is supported by angles riveted to the shell and does not come in direct contact with the shell, and air-space being left between the shell and the box, thereby reducing the expansion and contraction, and increasing the life of the wind-box. To the flanged portion of the box, which has as many openings as there are tuyeres, the individual tuyeres, made of casting-steel, are se-

cured by means of studs. To the shell of the converter is secured a steel casting, fitted with individual stuffing-boxes for each tuyere, each stuffing-box having a dovetail recess at its orifice for holding asbestos packing. The tuyere pipe-piece projects sufficiently into the converter to clear the magnesite or chromite lining. Each tuyere is closed with a cap provided with a valve and valve-seat. The valve is a hinged ball of hardened steel, the shape of which adjusts itself to the seat. This cap, with its self-contained valve and seat, is held to the tuyere by two studs, which permits of the rapid replacement of the valves. To remove the entire tuyere, all that is required is the removal of two nuts, breaking the connection between the tuyere and the wind-box. The cast-steel head on the rear end of each shell receives the end of the wind-box, which is fitted with a ball-joint concave flange, into which fits the ball-joint nipple of the cast-iron tee air-connection. As will be seen in the cut, this tee has a horizontal body-piece coupled to a lever. When the shell is in position, the nipple is forced into the concave flange by pushing the lever forward. With the nipple held rigidly in place, the position of the lever is secured by the balancing weight. On the driving end of each shell the head is fitted with a groove which matches a tongue on the universal coupling of the driving shaft. On each side of the tongue there is sufficient clearance for a key. By tapping a key into the clearance on each side of the tongue, the shell is rigidly connected to the drive. With this construction, the possibility of a back-lash is obviated, a detrimental feature formerly encountered in converters where a clearance was left between the tongue and the groove, which permitted of an acceleration of the motor before it picked up its load, and a consequent severe shock to the train of gears. Power for turning the shell is furnished by hydraulic pressure or electric current. The tilting of the converter by electric power is the method now coming into general use, as it offers many advantages over a converter tilted by hydraulic pressure.

The motors used are either direct-current variable-speed, high-torque, series-wound motors, or variable-speed, high-torque, induction motors built for two or three phase, 60-cycle, alternating current of suitable voltage. These motors are geared, so that the maximum speed of the shell is 1.2 revolutions per minute. The motor speed is controlled by a regulating and reversing controller, and the moving motor is stopped instantly and the load held safely, by a powerful electrically operated automatic brake. The motor shaft has geared connections to eliminate any possible end-motion on the armature shaft. The second reduction is made by a steel worm submerged in oil, and a bronze rim worm-wheel. The third reduction is made by cast-steel pinion meshing half-shrouded main steel-gear, which is fitted to the main driving shaft and connected to the shell by a flexible coupling. The high speed gears are cut, all bearings being machined, and the entire train of gears with the motor is protected with dust-proof housing. These converters are built in two standard sizes, 84 by 126 in. and 96 by 150 in., but if desired other sizes can be provided.

Publications Received.

'Compressed Air Plant for Mines: The Production, Transmission, and Use of Compressed Air, with Special Reference to Mine Service.' By Robert Peele. 8vo., pp. 344, Ill. New York. John Wiley & Sons. 1908. Price $3. For sale by the Mining and Scientific Press.

A simple concise treatise on air-compression has long been needed. The books available are for the most part either very technical or very superficial. Mr. Peele has filled the intervening space adequately and admirably. It represents that ideal kind of treatise which is educative in the best sense, and which can issue only from a man whose appreciation of the needs of others has been developed through just such a career as that of Mr. Peele—a well trained engineer in the first instance, experienced in the work of mining by years of actual practice, and ripened by further years spent in teaching as professor of mining in the Columbia School of Mines. The book is illustrated by cuts that truly illustrate, detail drawings being abundant for the elucidation of the text. The topics treated are, in part, structure and operation of compressors, theory of air-compression, wet and dry compressors, compounding, three chapters on values, duty, regulation, receivers, reduction for altitude, explosions, and finally, an excellent discussion of air-compression by the direct action of falling water, with descriptions and detail illustrations of the famous Magog and Victoria plants. Part second discusses transmission in great detail, difficulties and advantages of utilizing compressed air as a motive fluid in engines and pumps, re-heating, haulage by compressed air, and a general explanation of efficiency of air-drills. The book is amply supplied with explanations, formulae and tables for making needful calculations arising in connection with compressed-air application. It is a book which will be greatly appreciated as a guide and assistant to mine managers, engineers, and students. It is the best 'round-up' of the subject we have seen.

Commercial Paragraphs.

Allis-Chalmers Co., Milwaukee, is prepared to send its Bulletin No. 1431 to anyone interested in the operation of Huntington mills.

The Rix Compressed Air & Drill Co., San Francisco, announces that hereafter its office and salesroom will be at 371 Market street, and the factory at 219 Spear street.

David Goodale has retired as manager of the Compañia Minera Rio Tinto Mexicano, at Terrazas, Chih., Mexico, and will open an office for private practice at Berkeley, California.

The G. T. Ingersoll Machinery Co., Salt Lake, has recently put in two special Byron Jackson turbine pumps at the mill of the Boston Consolidated, on the shores of the Great Salt Lake. The static head under which the pumps work is 380 feet.

The National Battery Co., Buffalo, N. Y., announces that the receivership under which that Company has been operating since last February, was terminated August 19. The control of the re-organized Company rests with The Cutler Hammer Mfg. Co., of Milwaukee.

The Risdon Iron Works, San Francisco, received word last week that the gold dredge manufactured by them for the Nome, Montana & New Mexico Mining Co. started operation August 25. This dredge was erected in 50 days, which, considering the difficulties encountered in the Far North, is quite a record.

The Deister Concentrator Co., Fort Wayne, Ind., advises that it has recently received orders for Deister tables as follows: Four tables for the Coniagas Mines, Cobalt, Canada; eight for the Cia. Minera Cuchara y Anexas, Toluca, Mexico; four for the Granby Mining & Smelting Co., Joplin, Mo.; and one for the Buffalo Mines Co., Cobalt, Canada.

The Wood Drill Works, of Paterson, N. J., is distributing through its Mexican office, the International Machinery & Engineering Co., Edificio de la Mutua, Mexico, D. F., a 12-page booklet, neatly bound, entitled 'The Improved Wood Rock Drill,' giving a brief description of the Company's objects, some valuable information to drill purchasers, and some facts on the great Zuni dam, in New Mexico.

Catalogues Received.

The Goodman Mfg. Co., Chicago, has lately published Bulletin No. 401, descriptive of its line of single-motor locomotives.

The National Ore Concentration Co., Chicago, has recently published Bulletin No. 5, descriptive of the Woodbury system of concentration.

The U. S. Flexible Metallic Tubing Co., of Los Angeles and San Francisco, announces a new illustrated price list, which will be sent to those interested.

The Foos Gas Engine Co., Springfield, Ohio, has lately issued Circular No. 77, which is a well printed booklet giving particulars concerning gasoline hoists, a new type recently added to its line of horizontal and vertical engines.

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EDITORIAL.

WHILE THE REVIVAL in the shares of South African mining companies is of particular interest to London and Berlin, it is welcomed also in New York and San Francisco, for the recent rise in Kaffir shares indicates the re-awakening of interest in mining the world over. The depression in South Africans has been a wet blanket upon the international mining market, and we are glad to see signs of returning cheerfulness.

ON SEPTEMBER 19, and several days thereafter, the region around Nome suffered from an early and severe frost, which compelled a complete cessation of hydraulic mining and necessitated the diversion of water from the ditches. A heavy fall of snow followed, covering the ground to a depth of from two to six inches. We hope to hear that this did not mark the end of the operating season, but it looks discouraging. Locally, the occurrence would be termed "a dry freeze-up."

FROM A PROFESSIONAL point of view, we should be loath to accept the statement of Mr. James L. Callbreath, made before the Trans-Mississippi Congress, that "75 per cent of the best brains in the metallurgical world" is controlled today by the American Smelting & Refining Company. The aggregation of talent retained by that corporation is not as impressive today as it has been in the past, although it still includes some of the cleverest men engaged in fire metallurgy, but at no time, we are glad to say, did the smelter trust approach to within 25 per cent of a monopoly upon the best available talent in America.

OUR CORRESPONDENT at Kalgoorlie refers to an interesting case for breach of contract brought by Mr. E. S. King against the Ivanhoe Gold Corporation. It appears that a number of men, even with A. R. S. M. after their names, denied to Mr. King the status of a fully fledged metallurgist and decried the value of his services. Our sympathy is wholly with the man who "does things," whether his name has a luminous tail or not, and we are glad that Mr. King was able to enforce payment for services rendered. We have read in a book about brothers-in-law who did not agree as to what was honorable, and here also we venture to congratulate Mr. King on the verdict of the court.

BRIGHT is a beautifully situated little town in the Australian Alps. It has a race-course; the trustees of that race-course have given a syndicate the right to dredge the area comprised within its boundaries. It is a pity other race-courses are not gold-bearing in a natural way; unfortunately the

profitable character of them is dependent upon chicanery and fraud. Next let us put the race-track men to useful employment, and though they would be unfitted as a crew on a dredge, they might serve for those sad-sounding but necessary anchorages called 'dead-men.' We shall send a marked copy to Governor Hughes of New York.

IN ORDER TO ENCOURAGE investigation, a committee has been formed at Johannesburg for the purpose of considering proposals that have for their object the more economical extraction of gold from ore. It is stipulated that "any suggestion which the applicant considers patentable must be provisionally protected by him before being submitted to the Committee." This seems likely to defeat the whole purpose in view; if the Committee desire to prevent the overlap of inventive talent, it is their first duty to protect those who are contributing tentative ideas.

ROMANTIC as is the history of mining on the Comstock, it is safe to say that nowhere has the extraction of wealth from the ground on a large scale been accompanied by so much petty scheming and sordid chicanery. On another page Mr. Whitman Symmes, a trustworthy investigator, testifies to the rotten methods of the handful of brokers who have preyed for so many years upon the decadent energies of Virginia City and Gold Hill. It is not pleasant reading, and it would be no pleasure to devote our pages to the recital of the story, save for the hope that exposure may lead to reform. The history of Comstock mining proves the credulity of the public when dazzled by the records of past production, and the defenseless condition of scattered shareholders.

OUR CONTEMPORARY, the *Electrochemical and Metallurgical Industry*, makes frequent comment on professional matters in a thoughtful sympathetic manner, reflecting the wide culture of its accomplished editor. In the last issue kindly reference is made to the acceptance of a professorship by a successful metallurgist as evincing a professional altruism distinctly rare. We venture to add our own approval to the action of a friend, to emphasize the philosophic good sense of a college graduate sufficiently educated to know that man does not live by bread alone, that the shekels of the financier are not completely sustaining to the life of a broad-gauge man, that the accumulation of money beyond the necessities of cleanliness and comfort is a dreary business, and, finally, that to teach the young dynamic men of the country to be efficient is a task of patriotism, worthy of the best American citizen.

CALIFORNIA has lost some of her former prominence as a region for hydraulic mining, because the debris legislation put a stop to the big operations in the watersheds of the Sacramento and San Joaquin rivers. Hence, it is sometimes forgotten that hydraulic mining flourishes in the northern part of the State, especially in the region drained by the Trinity and Klamath rivers, where the obstructive farmer has been unable to place a benumbing hand upon the mining industry. Of the mines of this class in northern California, the most important is the La Grange, a historic enterprise, the details of which are related in this issue by Mr. Donald F. Campbell. While hydraulic mining has declined in importance along the foothill districts of the Sierra Nevada, the men who obtained their training in California are now playing a useful part in the development of the North; they are contributing their assistance to the exploration of the rich alluvium of the Yukon and Alaska.

Discussion.

THE DEPARTMENT of this journal devoted to discussion is growing in importance and we are glad to note the development, for there is good reason to believe that the 'letters to the editor' serve an excellent purpose. Apart from the information afforded by many of them, such communications from our readers are useful in checking any extravagance of opinion or any violent prejudices on the part of the editor. It is well to have a subject discussed from many points of view, and it is salutary to feel that a correction is possible from the outside. Assuredly the editors of this journal welcome the free expression of opinion on the part of their readers, as tending to a sane balance and as conducive to an increased interest in the pages of this periodical publication. The Discussion department has proved useful in eliciting special information; it serves as a clearing house of ideas and experience. Occasionally a letter is signed with initials or a *nom de guerre*. In such cases the identity of the writer is known to the Editor, for no really anonymous communication is ever accepted. As a matter of good faith, every contributor must declare himself, even though his name be not published. Undoubtedly 'letters to the editor' must be bonâ-fide expressions of independent opinion, and when a member of the editorial staff chooses to step down, as it were, from the pulpit and speak from among the congregation, he must do so without masquerading under an assumed name. The 'letters to the editor' are the comments of the reader in response to the comment of the editor, and when occasionally an editor wishes to speak as an individual observer or as a specialist in a particular subject, he may find it simpler to place himself among the readers. At least that is our practice, for our editors have been so recently engaged as engineers and geologists that they like once in a while to get into the mêlée of a controversy rather than pose as judges detached from the fun of conflict. Recently *The Times* lost a libel suit to Mr. John Murray, the publisher. It was proved that a letter to the editor signed 'Artifex' was written at the suggestion of the manager of *The Times* book department and was not the expression of opinion volunteered by an independent person. The letter attacked Mr. Murray by imputing extortionate prices for a book he had published. The jury returned a verdict in favor of Mr. Murray and assessed the damages at $37,500. This incident brought up the whole subject of 'letters to the editor' and tended to emphasize the value

of this department as an index to current opinion. As *The Spectator* says: "'Letters to the editor' should be the home, not of procured opinion, but of the facts (the nature of public opinion itself being a fact) which the editor has to face. He may try to direct facts, to secure that they shall or shall not occur again, but he must not suppress them or tamper with them as such. We believe this criticism from the readers to be an instrument for thrashing out problems and getting at the truth which is of first-rate value." We second the motion.

Trans-Mississippi Commercial Congress.

THAT was a curious blunder which the Mayor of San Francisco made in his speech of welcome when he spoke of San Francisco as "the westernmost city in the United States." The Congress before which he stood has been giving lessons in economic geography for 19 years, and one of the chief lessons has been to emphasize the importance of the westward movement of industrial development. As every up-to-date schoolboy, at least in Alaska, will tell you, San Francisco is situated east of the geographic centre of the United States, and if you sail from San Francisco to Unalaska or Nome, you will become impressed with the fact. This does not include the distant possessions of Hawaii, Guam, and the Philippine Islands, but only the continental portion of America and its peninsular projection into the Pacific Ocean. However, the Mayor made a speech that was scholarly; it was a credit to the wave of reform that placed him at the head of the municipal government of San Francisco. Assuredly his address, abounding in literary touches, in serious thought, in facts and figures, was a pleasant contrast to the drivel that emanated from the Governor of the State and the senior Senator. The sophomoric rubbish of the first and the puerile platitudes of the second were fitly representative of the sinister agency that placed these men in office. By no stretch of the imagination can such men be deemed proper spokesmen for the Commonwealth of California. Yet their participation in the opening of the Congress is not without encouragement, as indicating respect for a body of men engaged in the crystallization of public opinion. The Trans-Mississippi Commercial Congress is an extra-legislative parliament of the leaders in commerce and industry, assembling annually for the purpose of ascertaining the needs of the country west of the Mississippi river, and of formulating a demand for the fulfilment of such needs by legislation. The growth in importance of this Congress, of the Mining Congress, and of the Irrigation Congress, is proof direct of the unrepresentative character of the National and State legislatures; it is a recognition of the fact that the Forakers and the Baileys, the Platts and the Depews are sent by the big corporations to safeguard special priviliges and selfish interests. Of course, all the gentlemen participating in these annual gatherings are not altruists, nor even undiluted patriots, but for the most part they are prompted by public spirit to give their time and energy to deliberations designed for the common good. For instance, we note with pleasure the participation in these proceedings of such men as Mr. Thomas F. Walsh, a man who by sheer luck and the generous laws of the United States was able to become possessed legally of a marvellously rich portion of the public domain in the form of a gold mine. What is more fitting than that a mine operator enriched by millions extracted by him with the permission of the State out of the mountains of Colorado, should now devote his leisure to public service. Whether he be rewarded by the Presidency of the Congress, or later by a Senatorship, is neither here nor there, save as it may place the seal of public approval upon his services to the community. With even greater pleasure we note the participation of Mr. Benjamin Ide Wheeler, the statesman who is president of the University of California, whose splendid speech was an oration in that it smote those chords of true feeling to which all men vibrate when at their best. Nor were we sorry to see Mr. J. C. Stubbs, the traffic manager of the Harriman railroads, endeavoring to beguile the thoughtless by a few soothing remarks. It was a sign of the times, as testifying to the desire to placate the wave of criticism that has threatened the big manipulators of railroads and railway shares. Another speaker, who spoke on an important topic, was Mr. John J. Barrett, to whom Nature allotted a voice of rare resonance not often used to such good purpose as when this week he made a vigorous plea for the stimulation of sea-going traffic between the port of San Francisco and the Latin-American republics to the southward. Truly the wretched steamship service between the cities on the Pacific Coast of North America and those of South America calls for condemnation. We are glad to note a recent improvement; for the Canadian Pacific Railway now runs comfortable steamers from Vancouver to the west coast of Mexico, and a French line makes calls between San Francisco and Valparaiso. The trade of South America is being diverted to England, Germany, and Japan, mainly because the American commercial agencies have neglected to take adequate interest in the maintenance of a seaboard traffic with the rich regions of our neighbor continent. We thank Mr. Barrett for raising his fine voice to such good purpose. The California Traffic Association passed a resolution strongly condemning the insufficient service afforded by the Pacific Mail Steamship Company between San Francisco and the Isthmus of Panama. Mining interests were to the fore when Mr. James L. Callbreath, secretary of the Mining Congress, made an argument for a Bureau of Mining in the National Government. This seems assured at the next session of Congress, and we hope it may prove a valuable aid to the regulation of an industry that has played a dominant part in the development of the United States. But the most striking feature of the Congress was the keen interest taken in the message from the President of the United States. It was announced that Mr. William R. Wheeler, Assistant Secretary of Commerce and Labor, would bring a special message from Mr. Roosevelt, and it was noteworthy that many men sat during the weak inanities of the addresses of welcome in patient expectation of hearing something worth while from the virile

reformer at Washington. Mr. Wheeler did not deliver his message with any special grace, but it proved deeply suggestive, for the President sent word that the Panama Canal would soon be completed, and steps would then be taken to divert the tide of European immigration from Atlantic seaports to those of the Pacific, thereby creating a new channel for the influx of population to California and her neighbor States. Information from other sources leads us to doubt whether the Panama Canal will be finished as soon as the President assumes, but we hope he is right and our informants wrong. In any event, there is food for thought in this idea of diverting immigration to the Pacific States. On the whole, we only regret that the Trans-Mississippi Congress was in session so short a time, and that so large a part of that brief period should have been wasted in addresses of welcome that were merely sound, signifying nothing.

Should Mining Engineers Advertise?

OUR contemporary at London asks the foregoing question, and apparently deems it inexpedient to provide the answer. We appreciate that it is a difficult problem and it is best let alone unless tackled frankly, for in matters of this kind the only chance of arriving at a decision by means of discussion is to be outspoken. Mere coquetting with the subject ends only in a verbal flirtation. And it is worth while to reply to this question sincerely, for it is one of general interest to the profession, as affecting the unwritten code now in process of development. No discussion is profitable that starts without a definition of the terms employed. In our query the salient word is 'advertise'. What is the significance of this term? To 'advertise' is "to make known by public notice, to publish abroad" certain facts concerning an article of commerce or a commercial undertaking. Advertisement ordinarily involves a publicity favorable to the making of money thereby. In England the idea still survives that anything savoring of the shop-keeper is necessarily vulgar, and the attainment of public notice by methods in any way resembling the placing of wares on a counter is held to be inherently reprehensible. Therefore a professional man will allow others to discover his merits, and prefers even to freeze in splendid isolation rather than invite the warm glare of publicity. For a kindred reason, geology in Britain scorns the study of ore deposits, and it is deemed gentlemanly to investigate molluscs rather than ores, scenery rather than outcrops. This is part of a heritage of make-believe and the offspring of a mental snobbishness inseparable from a condition of society in which a foolish Duke is regarded with more respect than a wise carpenter. In America we see things otherwise, not that our people are superior in their intelligence but simply more free to think for themselves. Occasionally the result is chaos, but occasionally also the result makes for light. In the spacious environment of a new country, amid the fresh air of mountain and prairie, some of the sophisms of the old world look like mildewed spider's webs, only seen to be brushed aside. To us commerce is no less noble than idleness, wealth won by industry no less honorable than that which is inherited, and a professional man no better than a workman, except in so far as he can prove himself a better citizen. To the American there is no taint in commerce, and as science becomes applied to industry so also business methods are brought more generally to the aid of professional practice. One of these is advertising. In a community that accepts competition as a stimulant to efficiency the idea of excelling carries with it the notion of excellent. The young engineer hopes to get out from among the indistinguishable herd, from among the "and others" and the "also ran" of life. The older men with an established position recognize that it is expected of them to show their mettle when challenged, to be ready to step to the front, to maintain the healthy pace of an invigorating rivalry. To blow a horn or to hire the town-crier is to provoke derision, for a sense of humor obtains; to advertise individual ability after the manner of a soap manufacturer is undignified and therefore ineffective; to provoke constant notice is tiresome. Other ways are available, among these the publicity obtainable from a venal and sensational daily press is the most obvious, but it fails because the medium is not persuasive. Moreover, even commerce does not kill tact, even money will not exterminate taste. The American mining engineer knows usually what is befitting a professional man, for such knowledge is innate among men of sensibility on both sides of the Atlantic. So there remains the publicity of success, the scholarly distinction of the pen, and the plain advertisement of a directory. Owing to the facility of modern methods of communication, whether by post or telegraph, by telephone or aerogram, the names of those who win notable success as technical advisors or as managers of important mining enterprises are speedily whispered, if not shouted, along the copper wires, and instant celebrity is the reward of the man who proves extraordinary merit. To those at whose doors opportunity does not knock as loudly or on whom fortune does not smile as blandly, it remains to assert their preparedness for special work by contributing to the mass of written information upon which progress is largely based. Some there be who have the time both to do things and to write about them, to ruminate and to crystallize, to help themselves and to help their brothers at the same time. Finally, while it is not good form to shout from the house tops, to subsidize the daily press, to claim inspiration denied to others, or to offer services after the fashion of a corybantic vendor in the street, yet we think it desirable for an engineer to place his name and address in a list containing the active members of his profession, to the end that his friends may know where he is, and what he is doing. Such advertising involves no claim to pre-eminence, necessitates no bombast, and violates no notions of decorum. We are not aware that the mining profession in America lacks any of the dignity of the same profession in Britain, nor can we see how the commercial idea has contaminated the fountains of scientific investigation. Our answer to the query is: Yes.

Personal.

H. F. Collins is in Cornwall.

Arthur Lakes is at San Diego.

Charles S. Herzig is in Nicaragua.

Francis Drake is here from London.

E. O. Daue is at Guanajuato, Mexico.

Charles Butters is at Copala, Mexico.

J. Power Hutchins is at Pierce, Idaho.

S. H. Loram is stationed at Valparaiso, Chile.

G. S. Tyler, of Gaston, Cal., is in San Francisco.

A. G. Kirby, of Goldfield, Nevada, is at New York.

S. F. Emmons is on his way from Paris to Washington.

W. F. Ferrier was in San Francisco, on his way to New York.

A. L. Clark has returned to San Raphael from Reno, Nevada.

Algernon Del Mar is examining mines at Rawhide, Nevada.

M. H. Kubyla is with the Esperanza Mining Co., at El Oro, Mexico.

Robert Linton, of New York, was here, on his way to Los Angeles.

Charles Hoyle is manager of the Esperanza mine, at El Oro, Mexico.

George A. Denny is examining the Los Ancos mine, at Sultepec, Mexico.

K. Y. Sisido is assayer for the Nome Bank & Trust Co., at Nome, Alaska.

S. E. Bretherton has moved his office to 422 Montgomery St., San Francisco.

Edward L. Stenger has left Grass Valley, California, and is now at Berkeley.

C. M. Yeomans, formerly at El Oro, Mexico, has been surveying a railroad in Java.

Harry D. Griffiths is general manager of the Tronoh mines, in the Malay Peninsula.

Arthur Feust is superintendent of the Standard Consolidated Mines, at Bodie, California.

L. S. Austin has returned to Houghton, from an extended journey in the iron mining region.

Robert M. Raymond is spending a few days at El Tovar, on the edge of the Grand Canyon, Arizona.

Hugh R. Van Wagenen is at Valdez, Alaska, on his return from the copper mines on Chitina river.

Cortlandt E. Palmer is now consulting engineer, instead of general manager, to the Guanajuato Development Company.

Thomas F. Walsh, of Denver and Washington, has been elected president of the Trans-Mississippi Commercial Congress.

Wm. L. Chapman, superintendent for the Golden Jubilee Mining & Milling Co., at Coffee, Trinity county, is at the St. Francis.

Sumner E. Brown has gone to Alunite, Nevada, to serve as assayer for the company organized by Robert T. Hill, of New York.

Willard S. Morse will leave Salt Lake City and return to New York, in the service of the American Smelting & Refining Company.

S. J. Truscott has resigned as manager of the Redjang Lebong mines, in Sumatra, and has opened an office at 43 Threadneedle St., London.

Dividends.

On October 3 the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 133, of $75,000. This makes the amount of dividends paid since January 1, $705,000, and the total to date $10,521,000.

Latest Market Reports.

LOCAL METAL PRICES—October 8.

Antimony	12@16c	Quicksilver (flask)	$43@44
Casting Copper (scrap)	8¼@13½c	Spelter	6½@7¼c
Pig Lead	4.75@5.80c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Oct. 1. £. s. d.	Oct. 8. £. s. d.
Camp Bird	0 13 3	0 13 0
El Oro	1 6 3	1 5 0
Esperanza	3 8 9	3 4 4½
Dolores	1 10 0	1 10 0
Oroville Dredging	0 11 6	0 11 0
Stratton's Independence	0 1 0	0 1 0
Tomboy	1 2 6	1 2 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Oct. 2	13.31	4.45	4.78	51½
" 3	13.31	4.45	4.78	51⅝
" 4	Sunday.	No market.		
" 5	13.31	4.45	4.78	51⅞
" 6	13.25	4.43	4.78	51¾
" 7	13.25	4.43	4.78	51⅞
" 8	13.25	4.43	4.78	51⅝

MINING STOCK QUOTATIONS—NEW YORK.

Closing prices.

	Oct. 1.	Oct. 8.
Amalgamated Copper	74½	74¼
American Smelting & Refining Co	84⅝	85⅜
Boston Copper	13⅜	13⅝
Butte Coalition	24	24
Cumberland Ely	7½	7½
Dolores	6½	7
El Rayo	3¼	3½
Giroux	4⅛	4¼
Greene-Cananea	10⅛	10¼
Indiana Sonora	4¾	5
La Rose	6½	6¼
Miami Copper	10¼	10
Nevada Consolidated	15½	15⅞
Newhouse	5⅝	5⅛
Nipissing	8½	8
Ohio Copper		3
Tennessee Copper	41	40½
Utah Copper	41⅝	40½
Yukon	4½	4½

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, October 8.

Atlanta	$ 21	Laguna	$1.12½
Belmont	1.17½	MacNamara	52
Booth	38	Manhattan Con	5
Columbia Mtn	23	Midway	29
Combination Fraction	1.17½	Montana Tonopah	95
Daisy	76	Nevada Hills	1.05
Fairview Eagle	35	Rawhide Queen	64
Florence	3.37½	Sandstorm	23
Gold Bar (Bullfrog)	3	Silver Pick	16
Goldfield Con	5.45	St. Ives	26
Gold Kewenas	30	Tonopah Extension	62
Great Bend	30	Tonopah of Nevada	7.00
Jim Butler	24	Tramp Con	16
Jumbo Extension	30	West End	52

(By courtesy of W. C. Ralston, 353 Bush St.)

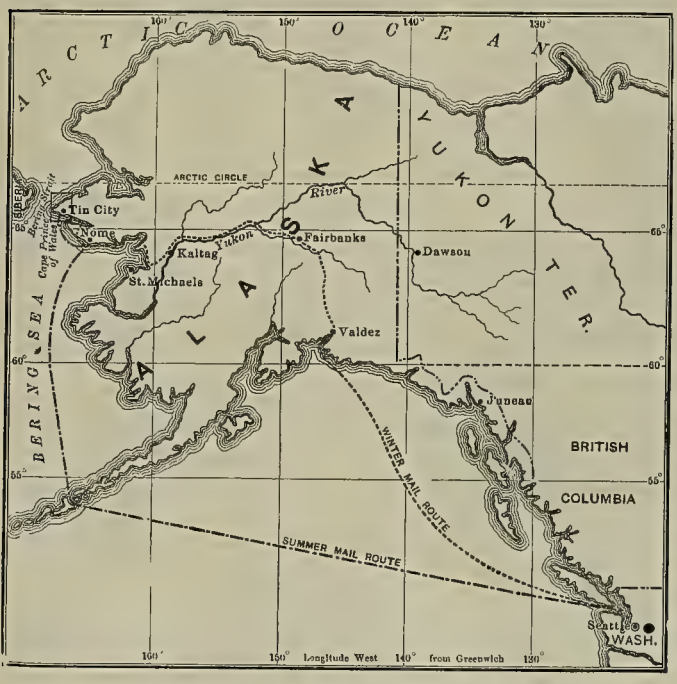
COPPER SHARES—BOSTON.

	Closing prices. October 8.		Closing prices October 8.
Adventure	8¼	Mohawk	63
Ahmeek	110	Nevada Con	15⅞
Allouez	37	North Butte	81
Amalgamated	74⅛	Old Dominion	44¼
Arcadian	3½	Osceola	117
Atlantic	17¼	Parrot	26½
Bingham Con	——	Phœnix	50
Boston Con	13½	Quincy	93
Butte Coalition	24¼	Rhode Island	4
Calumet & Arizona	115	Santa Fe	1¾
Calumet & Hecla	660	Shannon	15
Centennial	34	Superior & Pittsburg	14
Copper Range	73	Tamarack	71
Daly-West	9	Trinity	16¼
Franklin	12	United Copper Con	10½
Granby	98	Utah Copper	40¼
Greene-Cananea, ctf	10	Victoria	4¼
Isle Royale	22½	Winona	5¼
Mass	5¾	Wolverine	137

General Mining News.

ALASKA.

The London firm of Leopold Hirsch & Co. has taken over the interests in Alaska of the Valdez-Yukon Railway Co. and the Hubbard Elliott Mining Co. The contract gives the London capitalists three years in which to complete the railroad to the interior copper districts. In addition to the main line to the copper mines, a branch is projected to run from the Copper river across the Tazlina divide 60 miles to the Matanuska coalfields, where the Company also owns property. As soon as the coal mines are reached smelters will be constructed at some point on Valdez bay. If climatic conditions are right, preliminary railroad work will be done this fall, otherwise nothing will be done until the spring. The Valdez railroad will compete with the Morgan-Guggenheim road now building from



Map of Alaska.

Cordova.——Reports from Fairbanks indicate a continued drought and consequent inability of the miners to make clean-ups. Every one is hoping for rain before the close of the season.——If the gold be washed the last thing this season, it will likely be too late for shipment to the outside by steamer, in which event large shipments may be made over the winter route. Sometimes gold is sent out of the country in winter so as to get it invested and begin to get interest on it rather than let it lie idle for six months.——The Yukon Gold Co. is arranging to group virtually all its properties on Bonanza, Eldorado, Hunker, the Klondike, and their tributaries in one group for representation. They are to be made appurtenant jointly to the pipe line, the dredges, the conveyors, and other such big works as the Company maintains. The properties have been maintained by these workings in the past, but in several groupings. The claims on Hunker alone owned by the Company aggregate 233. This will be the largest grouping of claims ever made in the Territory by one concern.——Reports from Last Chance indicate a successful season, plenty of water, and many operators. On Last Chance are plants operated by Dolan, Collins, Younkins, Day, and Wilson & Townsend. Dolan has a plant on Treasure, and Dolin & Collins on Faulkner.——Sluice-box robberies have been made within two weeks on four of the largest claims in the Nome district. Robberies of this character have of late become more and more frequent. The four big claims that have just been robbed are the Bessie, Lakeview, No. 13 Dry Creek, and No. 13 Osborne Creek. Just how much gold has been stolen is not known, but it is believed that the robbers made way with thousands of dollars worth of dust.——It is reported that Ivan Brostrom has found a quartz vein 20 miles up the coast from Nome which is 300 ft. wide, giving assays all the way from $5 to $10. Two men are at work sinking a shaft.——F. Darlington was in Nome recently investigating the prospects for a plant on Chicago creek to furnish electric power to the Candle, Inmachuk, Good Hope, and Kougarok mining districts. The plan is to use the Chicago Creek coal and generate electricity at a high pressure for transmission to the various dredges, conveyors, pumps, and other machinery required.——The Nome D. & M. Co. has decided to start a gasoline drill at work on its property in the Tishou River country. The holdings consist of a large tract of dredging ground.

ARIZONA.

COCHISE COUNTY.

The San Simon Copper Co. is soon to start assessment work on its group of 40 claims near Paradise. Marshall Estes will have charge of the work and will employ five men.——The contract for the annual labor on the Rabbit group of claims, near Dunn Springs, has been let to W. H. Smith.——The Uncle Sam shaft of the Copper Queen has been equipped with cages instead of the buckets that were in use since the beginning of work at that shaft.

GILA COUNTY.

At the Superior & Boston property a good start has been made to sink the new working shaft for the Great Eastern mine. The location of the shaft is on the Copper Money claim of the Collins & Doyle group, which has been acquired by the Superior & Boston Co., and is distant from the present Great Eastern shaft over 1000 ft. in a northerly direction.——It is probable that the Arizona Commercial Copper Co. will build a smelter on its Pontiac claim, 800 or 900 ft. northwest of the Eureka shaft.——It is expected that the contracts for structural steel and machinery for the plant will be placed within the next few weeks, and the smelter should be completed late in the spring of 1909. The capacity of the plant is to be 300 tons, but will be arranged with the expectation of its enlargement when greater capacity is needed. By the time the smelter is ready to go into commission the Eureka shaft will have been sunk several hundred feet and levels at 625 and 750 ft. well advanced. Development at the east end of the Black Hawk, below the 500-ft. level, will also be in progress, and there is little doubt that the ore supply will be ample.——The Globe Consolidated has started shipments from its Gem mine to the Old Dominion smelter. The vein recently found on the 12th level has widened from three to seven feet, and the latest assays show 6½% copper.

PINAL COUNTY.

(Special Correspondence).—The Vekol mine, which in the past was second only to the famous old Silver King mine in the production of silver, has resumed work under new ownership and management. The mine is situated in the Vekol range, 35 miles south of Casa Grande. The ore lies in irregular chambers in a hard carbonate of lime, which has the appearance of having been crushed to nut size and then re-cemented by calcarious solution. Talc seams run from one ore chamber to another, and were formerly an unfailing guide in tracing orebodies. The property is now owned and controlled by the Vekol Mining Co., which was organized a year ago by E. S. Garnett, of

Alabama, and William Forbach, of Casa Grande. This Company took over the six mines belonging to the old Vekol group and 46 other claims. Active work was begun last March under the management of Mr. Forbach with a good force of men, since which time work has been pushed with marked success. A double-compartment shaft is now down 380 ft., where a large supply of water was struck simultaneously with reaching a promising orebody. Stations have been made at the 120 and 380-ft. levels and drifts are being driven both north and south. Within two or three weeks the shipping of the high-grade ore to El Paso will commence, and if returns are satisfactory two carloads per week will be the regular shipment. The mill, which has a capacity of 40 tons per day, will be put into commisison in a week or two. H. R. Neuitt, of Denver, is now at the mine and will sample the dumps, containing over 350,000 tons of ore, which, from experiments already made, will yield over $1.50 per ton net. Mr. Neuitt will also determine the value of thousands of tons of low-grade ore which has been stored away in the cross-cuts and stopes of the old workings. The ore blocked out in these workings embraces more than six miles of underground work, from which it is claimed $7,000,000 in silver and lead ores have been extracted.

Phoenix, October 3.

YUMA COUNTY.

The Castle Dome mine and the first north extension of the Flora Temple have recently been transferred to James M. Barney, a descendant of Col. James M. Barney, who with others located the Castle Dome in 1871. The new owner has interested several citizens of Phoenix in the property and it is hoped work will again be started. In the first year of its existence the Castle Dome produced 600 tons of ore averaging 60% lead and 30 oz. silver, and up to 1881 it had produced over $2,000,000.

CALIFORNIA.

NEVADA COUNTY.

(Special Correspondence).—Owing to the lack of sufficient water the Union Hill and several smaller mines have suspended operations, the Empire has hung up 20 stamps and has reduced the working force one-third. At the North Star, the Pennsylvania, and one or two others work is carried on steadily by the extensive use of steam.——The shaft at the Hill mine has been unwatered, a 12-hp. gasoline hoist installed, and sinking and driving are about to commence.——The shaft at the Morydena is down 73 ft. and the north drift from this point has cut a four-foot vein of good ore. An adit will be driven from the west side of the hill to connect with the shaft, 500 ft. distant. A group of English capitalists are interested.——W. L. Hemmingston and J. L. Green have taken a long-term bond on the Rose Hill mine at Nevada City and will proceed with active developments. Three shifts of men will be employed. The Rose Hill has laid idle for eight years, although considered a meritorious property. C. D. Tregonning is superintendent.——The Wahpiti M. Co. has been incorporated at Nevada City to work the Black Bear mine near Rough and Ready. The capitalization is for $250,000, par value of stock $1.

Grass Valley, October 4.

SACRAMENTO COUNTY.

Eleven men are under arrest in Sacramento suspected of having had a part in the recent theft of amalgam from the Hanford-Gerber dredges near Folsom, four of whom have already pleaded guilty. It is estimated that between $15,000 and $25,000 has been stolen, and only $500 has been recovered. The owners of the dredge will institute a civil action to secure possession of the plunder.

SHASTA COUNTY.

The Black Tom Mining Co. is sinking a shaft on the Scorpion mine, at French gulch, and is now cross-cutting and driving on the 100-ft. level. There is one vein four feet wide that averages $25 per ton milling ore. There are two other veins opened up on the adit level which average from $7 to $10 per ton. The Company will continue sinking the Scorpion shaft to the 500-ft. level, when it will open up and develop the orebodies on each level.——Men have started to re-timber the O'Neil adit at the Niagara mine and also re-timber the St. Auburn winze, opening up and developing the orebodies which have been worked out above. The Company has started to erect a new 10-stamp mill and expects to have the stamps dropping on ore within sixty days. The force consists of thirty-five men.——The Delta Consolidated Gold Mining Co. is again taking up the subject of construction of narrow-gauge tram or railroad from Delta on the Southern Pacific railroad to a point six or seven miles up Dog creek, where the mines are situated. M. E. Dittmar and S. T. White, of Redding, are interested.

SIERRA COUNTY.

The Morse Bros. are doing the assessment work on the Brown Bear claim on the upper end of the St. Charles Hill ridge, between Snow and Fiddle creeks. It is the intention of the owners to drive an adit to strike the channel. ——The mill at the Gray Eagle ran for only a few days last week because of a shortage of teams to haul ore. More have been obtained now and the work is to be continued without interruption. Two new shoots have recently been opened up in the adit, and one shows considerable free gold.——Six men are building the dam at the power-site of the Mexican mine, a mile from Downieville on the South Fork. The dam will be 18 ft. high, giving a fall of 30 ft., which should develop about 300 hp. ——The shaft on the Rock creek, being sunk by Mott & Morrison, has reached bedrock and work has been suspended until next spring.

SISKIYOU COUNTY.

A company of New York capitalists have secured the Granite mine, on Humbug creek, and are preparing to push the work of development on a scale well justified by the showing. This property has been a producer for over 30 years, but has never been worked properly. Charles A. Mitchell has charge of the new work, and will immediately start to sink a shaft to a depth of 500 ft. on the vein. ——The big ditch of the Klondyke Mining Co. which is to take water from the Klamath river and generate electric power to operate the new Huntington mill is nearing completion. There is sufficient water to develop 500 hp., but only 150 will be used at the present time, the remainder being sold to neighboring properties.——Shore & Heriford have taken a contract for a 130-ft. adit on the 220-ft. level of the Highland mine. The Highland is one of the mines which has furnished so much specimen ore that has been used in mining exhibits all over the coast.——Gardner & Weed have a force of men repairing flumes and clearing ditches along the Kidder creek and Shackelford ditches, and another force is at the mines building penstocks and cutting ditches to the new ground they are preparing to pipe as soon as water starts. They also have a force of men sinking upon a 50-acre tract newly purchased, in order to test more thoroughly the value of the auriferous gravel. The Company is preparing for one of the biggest runs ever made in this county, and as they have four ditches they are able to do double the work of any company that has hitherto worked the deposits along the Quartz Valley mountains.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence.)—A rich strike has been made on the Brighton property in the Freeland district, a body of $40 silver, lead, copper, and gold ore having been uncovered that is from 15 to 24 in. wide. The west drift has been run 75 ft. from the 900-ft. station of the shaft, while the east drift has been extended for 55 ft. The ore-shoot is showing for the entire distance. This property has levels every 100 ft. to the 500-ft. station, from which point sinking was continued until the bottom measured 930 ft. from surface. In the near future levels will be started at the 600, 700, and 800-ft. stations. During the last year regular shipments have been made, and effort is now to be made

to send out an increased tonnage. The property is equipped with a complete plant of machinery, as well as a 70-ton concentrating plant. J. C. Sturdevant, of Idaho Springs, is manager.——W. J. Guard, of Silver Plume, has taken a three years' bond and lease on the Martelon and the Mitchell lode mining claims, situated on Sherman Mtn., the bond being for $5000. A company is now in process of organization and work will be put under way at an early date. From the surface workings ore has been mined of a high grade, but it has been decided to start a cross-cut to intersect the veins at good depth.——The Wallace Con. M. Co. has deeded to Chester A. Finch the Wallace group of ten lode claims, in the Cascade district. The consideration is given at $5000 cash. Mr. Finch will organize a company and start operations at once.——Kavanaugh & Co., leasing on the Wisconsin, are sending out regular shipments of 350-oz. silver ore. Since the adit intersected the vein above the old stopes in the upper workings the drift has been run for 75 ft., with a streak of ore that is from 10 to 16 in. wide showing all the way. Stoping has been started and in the future the output will be increased. Directly below these workings a production of $400,000 was made a few years ago from a block of ground 400 ft. long and 200 ft. deep.——The streak of ore in the Sporting Times, Alpine Mtn., has widened from 6 to 10 in. during the last week. The ore is more solid than formerly and asssy show 3 oz. gold, 40 oz. silver, and 61% lead. It is the purpose of A. H. Colburn, the owner, to continue the drift for 50 ft., at which time stoping will be started. The showing in this property is such that a number of owners of mines have signified their intention of starting work at an early date.——The showing at the Bellevue-Hudson is better today than at any time during the last six years. M. Mouatt, who is operating a block of ground on the Anamosa vein, is running a drift to the east and is following a streak of ore that is from 14 to 16 in. wide, which assays from 150 to 175 oz. silver. A winze is being put down from the sixth level, in the bottom of which a 10-in. streak of ore is showing. Driving will be started as soon as a depth of 75 ft. has been attained. The Holmberg M. & M. Co., owning the property, has just installed a washer near the portal of the sixth level and now a large amount of dump matter is being treated. This stuff was thrown away during the early history of operations, when no ore was marketed that was worth less than $100 per ton. J. A. Holmberg, of Denver, is manager.——J. G. Roberts, of Idaho Springs, has installed a number of rough jigs at the dumps of the Lamartine mine and is handling a heavy tonnage of dump matter. After jigging, the product is sent to the Jackson mill, where it is concentrated, and fair returns are being realized from the process.—— The Colorado Central is sending out more ore today than at any time during the past year. On the Ocean Wave level, F. A. Maxwell, the lessee, is running a drift on an ore vein that is fully 18 in. wide, and from recent shipment returns varying from 500 to 700 oz. silver per ton have been realized. Stoping is also in progress to the east of the Ashcroft stope and a good tonnage of ore is being mined.——Shipments will be started shortly from the Mountain Quail mine, up the gulch between Griffith and Alpine Mtn. In the breast of the adit there is showing a streak of $30 silver-lead ore that is much desired by the Denver smelters. L. Hoery, of Georgetown, is owner.

Georgetown, October 3.

GILPIN COUNTY.

A good strike is reported from the 150-ft. level of the Champion property in the Phoenix district, where an 8-in. streak of smelting ore is reported to carry 2.60 oz. gold, 1.6 oz. silver, and 15% copper. Ore is being hauled to the Champion mill which is reported to be giving average returns.——Arrangements are being made for the installation of another 80-hp. boiler at the Evergreen property in the Pine Creek district and some alterations and improvements are to be made in the new concentrating mill, which it is believed will effect a higher extraction. W. H. Grayson is manager.——Weiskotten & Ward, who are interested in the Victor property on Mineral hill in the Phoenix district north of Boulder Park, have organized a company of Eastern people and are making arrangements for the active development of the property. Mr. Weiskotten will go East in a few days in the interests of the Company.——Miller, Mellow & Co., operating the East Leavenworth mine in Russell district, have made a big strike in the shaft at a depth of 220 ft. They commenced sinking during the early part of the month on a crevice which has since widened out to the entire width of the shaft and there is a smelting streak about 20 in. wide which shows yellow copper and is better than the average grade.

HINSDALE COUNTY.

F. C. Goudy and George M. Duke have purchased the Newport property, near Lake City and in the vicinity of Burrows Park. They have a force of men on development work and expect to continue work until the snow flies. They have a 7-ft. vein of fine mineral, much of it being shipping ore and the rest a good quality of milling ore. The test runs that have been made at the Durango smelter have turned out remarkably well and are most encouraging for the owners of the property. Next summer, if conditions justify, a reduction plant will be erected and the Newport will become a heavy producer and shipper.

LAKE COUNTY.

The Wire Patch mill, which was partially destroyed by fire a few weeks ago, has been practically re-built, and connections have been completed with the lines of the Central Colorado Power Co. The mill will at once be put in operation, treating the ore from the Wire Patch adit as well as that from other mines in Summit county.——Favorable work is being done on the Black Prince property on Breece hill, which is being operated by Vernier & Shipley in connection with the Highland Chief mine. Both are producing good iron ore, and shipments to the Leadville smelter have been regular.

SAN JUAN COUNTY.

A new cross-cut 60 ft. long has been driven on the Golden Fleece and Scotia properties, which gives a depth of from 40 to 100 ft. below all the old workings. This new work has cut a vein of shipping ore which gives returns of 1¾ oz. gold and 207 oz. silver per ton. The Company is driving both ways on ore in this new vein, and will also sink a winze.——The mill on the Gold King was started recently for the first time since the fire on June 6. Three hundred men will soon be employed in the mine and mill. The mine was found to be in good condition.

SUMMIT COUNTY.

The Little Sallie Barber property, on Baldy Mtn., near Breckenridge, is putting in a new steam hoist. The shaft is 170 ft. deep and the inflow of water is so large that a pumping plant may be necessary.——The King Solomon adit, at Frisco, is now in 2045 ft. and work is progressing with 25 men employed. A drift in vein No. 2 has opened up an orebody assaying about $300 per ton.——The management of the Penn Ores Co. has put two shifts at work in the new Helen adit, and is expecting to strike some payable orebodies before long.——Operations will soon be resumed on the new Country Boy adit, the breast of which is now 1100 ft. from the portal. One of the richest streaks of zinc known in the camp was struck in this bore. ——The hull of the Reiling dredge was successfully launched in the Mekka pit last week, and the work of installing necessary machinery on the boat is now going forward rapidly, with as many men employed as it is possible to handle.——H. B. Barnes has contracted to install an air-compressor and Leyner drills at the Foremost mine, near Frisco. A. L. Moon is manager of the Foremost. At the Juno mine Mr. Barnes recently completed the installation of Temple-Ingersoll air-drills. Both properties take power from the Central Colorado Power Company.

TELLER COUNTY.

The main working shaft of the Index M. & M. Co., together with the surrounding territory owned by that corporation, has been secured under a two years' lease by Crip-

ple Creek and Eastern parties and operations have already commenced. A leasing company is in the course of formation and will shortly be incorporated when the identity of the leasing company's officials will be made public. The shaft on this Gold Hill mine has already been sunk to the 900-ft. level and extensive development work on a systematic plan has been determined on. Two promising veins, the northern extensions of Pointer and Keystone lodes are already exposed in the two deepest levels at the 900 and 700-ft. points. Connections between these two levels is to be made with all possible speed by raise and winze, so as to insure the thorough ventilation of these deep workings and the veins mentioned are to be exploited by driving to the limits of the estate.——Lambert & Boden, lessees on the surface workings of the Dearborn claim on Globe hill have opened up a new surface deposit and are saving ore for future shipment, carrying from $5 to $15 per ton. This ore is highly oxidized and can be mined at a minimum expense. In the early days of the camp teams and scrapers were used for the mining of similar ore and should the deposit prove to extend over a large enough area, the same method may be adopted by the present lessees.——The Union Leasing Co., operating on the Deadwood mine on Bull hill, has opened up a promising ore-shoot at the 450-ft. level and is breaking ore with machine drills from a four-foot vein, carrying from $18 to $38 per ton.——The total tonnage shipped from the Cripple Creek district during the month of September amounted to 67,313 tons with a bullion value of $1,396,080. These results are remarkable for the fact that, while the tonnage shows a decrease of 1575 tons over the month of August, the bullion value shows an increase of $65,316.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The suit of the Stanley Con. Mining Co. against the Hercules Mining Co., by which the former sought to close down the Hercules mill and recover $25,000 damages for tailing alleged to have been dumped on the Stanley ground, has been withdrawn in Spokane. It is understood that amicable arrangement has been made out of court.——The Hecla mine and mill at Burke closed for the afternoon of October 1 in honor of the funeral of J. R. Smith, president of the Hecla company, who died in Chicago last week.——The men at the Copper King property, in the Mullan district, are at present engaged in the installation of the new compressor to be used in the driving of the adit for which three assessments of one cent each were recently levied by the Company.——Work has practically been suspended on the Beartop mine, at Murray, and it is not expected that there will be any resumption until the construction of the Idaho Northern railroad has been completed. This is regarded as the next mine in the Coeur d'Alene to join the dividend list. It is estimated that there is already more than $500,000 worth of shipping ore alone between the two levels, in addition to thousands of tons of concentrating ore. As far as can be learned it is the intention of the Company to ship about 15 cars per month as soon as the railroad is completed.——The directors of the Helena-Frisco No. 1 Co. have acquired a controlling interest of the Nyctalops Co. from F. X. Latulippe and will now develop the entire group. It is the intention of the Company to run a 600-ft. adit to give a depth of between 700 and 800 ft. Work has already been started.——The grading for the 1600-ft. flume at the Coeur d'Alene Vulcan property has been completed and work on the construction of the flume itself will commence at the beginning of next week. The work on the dam at the property is almost completed and as soon as the flume has been done the men will start on the installation of the big new compressor.——The Charles Dickens mine, at Wardner, has been suddenly plunged into financial difficulties to the surprise of many stockholders in this part of the country, who had been in hopes that the better condition of the metal market would allow this Company to join the dividend list. The first suit against the Company of any size was filed by A. D. Gritman, manager of the property, and is for the recovery of about $54,000 on promissory notes secured by a mortgage on its property and mill. This suit has been followed by a large number of smaller suits, one of which contains assigned claims to the extent of almost $30,000. Just what action will be taken remains to be seen. So far the Company has been unusually unfortunate, having had its mill destroyed by fire last year almost as soon as it had been completed, while its successor had a narrow escape from the same fate during a forest fire this summer.——A three-foot vein of copper ore has been opened up in the property of the Champion Copper Co., in the Stevens Peak district. The ore has an average value of about 16% copper, and was found in a drift about 700 ft. long, at a depth of 600 ft., but so far the strike has not been exploited to any extent.——Development on the Paragon and the Chicago-London, two of the most promising mines in the whole of the North Side district, is about to be resumed, according to the statement of L. W. Stedman, manager of both. Some time ago work was stopped on account of the lack of power to run the 15-drill compressor with which both properties have been developed. For the present work will be continued by hand until the power supply is regained.——John E. Steen, president of the Granite & Allie Co., on which a sensational strike of ore was recently made, has announced that the shaft at the property is to be sunk another 100 ft. into the orebody. After cross-cutting the vein at a depth of 100 ft. a drift was run 25 ft. along the granite foot-wall through a solid body of ore. The adit was run through 24 ft. of ore, five feet of which is good shipping quality and the rest good concentrating ore. Mr. Steen is of the opinion that the orebody is 900 ft. long, as the vein has been opened for that distance by means of cuts and shafts. This property was at first supposed to be a gold proposition, and a stamp-mill was erected which is now to be converted into a concentrator and shipments are to commence as soon as the Idaho Northern railroad is completed.

Wallace, October 3.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The past fortnight in this district has been characterized by a number of important strikes. Perhaps the most noted was the orebody discovered at the Midnight mine, in the Belleville camp, near Joplin. A large underground cave was broken into which is filled with large boulders of pure zinc-blende and galena. The cave is approximately 100 ft. square and one side is richly lined with ore, while the other three sides show a small quantity. The floor is piled high with debris, among which is a large amount of ore. The drift is at the 140-ft. level and ore has been proved to a point 30 ft. lower. The mill is running steadily turning out from six to seven tons of zinc-blende and two to three of galena per shift.——Another rich strike has been made in the Leadville Hollow camp by the B. H. & B. Co. on the Granby M. & S. Co.'s land. The ore was found at a depth of 24 ft., and during the first week the Company took out 63,000 lb. of cleaned ore. The find is a continuation of the same deposit found in the adjoining Try More and Leonard leases. The first shaft sunk on the Granby land to catch this run of ore entered a limestone bar and was abandoned.——A rich deposit has been opened in south Joplin by I. M. Gardner & Son on the Roaring Springs land. The orebody was found at 85 ft. and a face of ore 9 ft. high by 14 ft. wide is being worked. The ore is in soft ground which has to be heavily timbered. A good turn-in has been made for some weeks, the ore being treated on hand jugs. A large crush-pile has accumulated which will run about 15 to 20% zinc-blende with some galena. Two shafts are in ore, though only one is used for hoisting; the other is used for pumping.——A body of free zinc ore has been opened on Turkey creek by Snyder & Watkins. A shaft was sunk some years ago, but because of excessive water it was abandoned upon reaching the orebody. The present company has re-opened the old shaft and started driving. The

ground was drained with little difficulty. A permanent derrick has been built and hand jigs are being installed. A portion of the ore occurs in large nuggets, while the larger part is very fine, and when panned out runs high in good-grade ore. A drill hole east of the shaft is in ore at the same level.——A rich deposit of galena and zinc-blende was found in an old shaft abandoned as worthless at Prosperity. The Lewis Mining Co. opened up the shaft, and after sinking two feet deeper penetrated the orebody. The material is very free and runs as high as 15% cencentrate. ——The Oronogo Circle No. 5 is building an 80-ft. extention to the mill, to be used in treating sludge. The plant has not been doing this work adequately, and the new portion will be given entirely to saving the fine which has been escaping in the tailing. Eleven new tables will be installed to treat the fine. The same company will build a sludge-mill to handle the fine from plants No. 1, 2, 3, and 7, but this will not be done until later. When the improvements are installed the Oronogo Circle No. 5 will have the most complete device in the district for the treatment of sludge. The plant is the largest single producer in Oronogo.

Joplin, October 3.

LAWRENCE COUNTY.

(Special Correspondence).—An important transaction was made in the Aurora camp when the United Zinc Co. leased all its holdings to the Magnolia L. & Z. Co. for a royalty of 10% on two tracts and 20% on a third. The higher royalty was required from the third lease because this tract is more thoroughly developed and the new Company has the use of all machinery. Prospecting includes 150 drill-holes, some of which are 250 ft. deep. A large number of shallow diggings are on the land and the recent rich lead strikes were made there. The land is said to have produced over $700,000 worth of ore.——The Sand Ridge mines in the northeastern part of Aurora are to be re-opened soon. An extensive system of pumps and flumes were installed last year. Some of the heaviest productions made in the Aurora camp have been made at the mines on this tract. The Company has one of the deepest shafts in the entire district.——The Triple B mine at Aurora is being re-opened by Landau & Stone. A shaft was sunk last year to 60 ft., where a 15-ft. face of ore was opened up. The heavy rains of the spring caused the ground to cave. A new shaft is being sunk and the work will be hastened until the ore deposit is reached again.

Aurora, October 3.

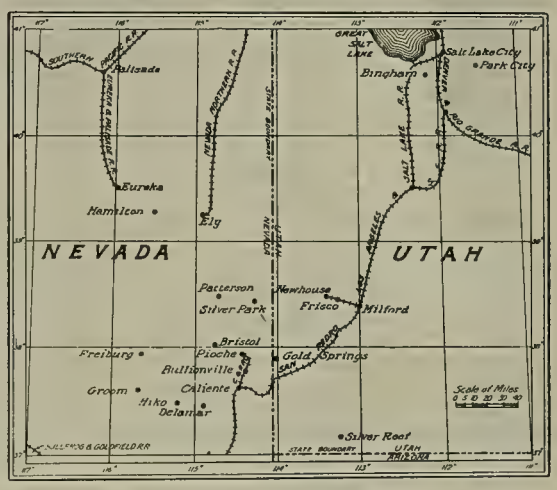
NEVADA.

ESMERALDA COUNTY.

It is reported that silver and nickel ore have both been found on the Red Top claim of the Goldfield Con. Mines Co.——The Penn Florence lease, which owns the old Winston block on the Cornishman claim of the Goldfield Florence, has been re-organized. The capitalization has been increased from 600,000 to 1,000,000 shares. The new officers are: Lewis H. Rogers, president; W. B. Winston, vice-president; Thomas F. Manning, secretary and treasurer. It is the intention to begin active development work at once.—— R. L. Hubbard, representing a minority stockholder of the Mohawk Jumbo Leasing Co., filed suit this week in the District Court against that corporation and the MacMillan-Holleran Co., demanding the restitution of $45,000 alleged to have been wrongfully paid for 300,000 shares in the Mohawk Red Top Lease Co., and for the appointment of a receiver for the Mohawk Jumbo Lease Co. The complaint alleges mismanagement of the latter company's affairs by the MacMillan-Holleran Co., and declares that the purchase of the stock of the Mohawk Red Top Lease Co., which is also controlled by the MacMillan-Holleran Co., was illegal.——The Jumbo Consolidated will resume work at once on its Gopher claim, and sink the shaft to a depth of 250 ft. An electric hoist will be put in at the North Star shaft and crosscutting will not be started until the 250-ft. level is reached. ——Work has been started on the group of claims belonging to the Indianapolis Goldfield M. & D. Co. at the north end of the Montezuma range, two and one-half miles west of Indian Springs. The office of the Company is at Frankfort, Indiana.——The 200-ft. shaft on the Economist claim of the Old Kaintuck Goldfield Mining Co. is being re-timbered preparatory to sinking to the 400-ft. level.——Diamondfield Jack Davis has begun work on block four of Combination No. 2, which he has under lease for 18 months. Goldfield and Los Angeles capitalists are interested with him in the property.——The National Ore Purchasing & Reduction Co. has been incorporated under the laws of Arizona to erect and operate mills and carry on an ore-purchasing business. The first point of operation will be Rawhide, where the Company plans to erect a 50-ton cyanide mill, including a sampling plant. Options on ore contracts have been secured from the principal lessees in the camp, arrangements have been made with the water company, and it is hoped construction will start at once. The proposed scale of treatment-charges ranges from $7.50 per ton on $15 ore to $25 on ore valued at $100 or over. Lochiel M. King and J. W. Heisner, of San Francisco, are interested.——The mines of Goldfield produced during the week ending October 3 a total of 2236 tons, of an estimated value of $282,075. During the same period the Tonopah mines produced 5741 tons, estimated to be worth $146,675.

LINCOLN COUNTY.

At Pioche the Golden Prince Mining Co. has found ore



Eastern Nevada and Western Utah.

asaying 698 oz. silver and 40% lead. This ore was found while stripping the vein in a westerly direction on the Black Hawk No. 2 claim, and is a surface showing.——The shaft which the Alunite Mining Co. is sinking on its property, in the new camp of Alunite, in Railroad pass, has reached a depth of 51 ft., although the hoist is not yet in commission. The Company is putting up substantial wooden buildings and evidently preparing for a permanent camp.——The Searchlight M. & M. Co. is planning to begin operation with a full force in the near future. H. E. Carter, who is general manager, has recently returned from New York, where he was successful in selling the bond issue of the Company. A 10-stamp mill, 100-ton cyanide plant, and a steam-hoist have recently been put in at the mine.

NYE COUNTY.

The regular quarterly dividend of 25c. per share of the Tonopah Mining Co. was declared last week, payable October 21.——The little two-stamp mill at Manhattan, known as the Veith-Plamenez, which has been running constantly day and night on ore from that camp, will be closed down temporarily, pending the installation of five additional stamps, the machinery for which is now on the ground. A little later a cyanide plant will be added.——The T. & T. Mining Co. has been organized by A. A. McKnight, W. C. Pollard, and Wm. Roddick, of Rhyolite. The capitalization is 1,000,000 shares, par value $1. The claims of the Company are on the Tonopah & Tidewater railroad, about 100 miles south of Rhyolite, and have a good showing

Special Correspondence.

LONDON.

New Great Wheal Fortune Syndicate. — Underwriter Sued to Fulfil Contract.—Labor Distribution in Mineral Industry. — Analysis of Accidents in Mines.—Enforcement of Mining Regulations.

I have often referred lately to the difficulties nowadays encountered by mining people on the lookout for the money necessary to acquire and open up properties. An unfortunate instance of this kind is to be found in the case of the New Great Wheal Fortune Syndicate, which I recorded a few months ago. It was formed for the purpose of acquiring a tin mine and a china clay deposit in the Breage district, about half way between Falmouth and Penzance. The mixing up of tin and china clay in one flotation is of doubtful advantage, and it appears to me that the working capital asked for, £12,500, is not nearly sufficient for one of the propositions alone. But no doubt at the time of flotation the directors expected there would be no difficulty in raising further funds if their preliminary operations gave encouraging results. As a result of the public flotation only £2500 was obtained. The remainder of the issue had been underwritten, so the directors proceeded to allotment. This underwriting contract turned out to be purely speculative, such as is far too common in the City of London. Even men of sound standing are prepared to undertake the underwriting of new issues, knowing that the directors seldom dare enforce the contract if the issue is a failure. In this case the directors sued the underwriter for the amount due from him, and the suit was set down for hearing in the courts. Before the case came on, the underwriter owned up to the fact that he could not pay at once, but promised that if the directors would suspend litigation he would give six-month bills for the amount of his indebtedness, and forego his underwriting commission. The directors accepted this proposition, and accordingly work was commenced at the tin mine last month. Under the circumstances it is not fair to mention the name of the underwriter. The board of directors consists of Sydney Fawns and two sound commercial men not connected with company-promotion or with other mining operations. Mr. Fawns is the author of a book on tin deposits, and learned his tin mining at Mount Bischof, in Tasmania, in which mine his family hold large interests. He has relieved the underwriter of £1000 of his liability by taking up shares to this amount.

It will no doubt seem remarkable to many American readers that the number of persons employed in Great Britain and Ireland in mining and quarrying operations is over a million. During the year 1907 the total number so employed was 1,060,034, of whom 972,220 were engaged at mines and 87,814 at quarries. Of those employed at the mines, 776,456 worked underground. Of the 195,764 working above ground 5864 were women and girls, most of whom were occupied in 'picking' coal. The number of miners employed during 1907 was an increase of 49,093 underground and 10,551 above ground, as compared with the figures for 1906. The total employed at coal mines was 925,097, from which it is obvious that the coal mining industry is the backbone of British mining. There were 17,494 employees at the iron mines of Cumberland and Yorkshire, the former being hematite mines and the latter carbonate mines. Other mines employed 29,629 men, of whom 8500 were in Cornwall.

As regards the 87,814 people employed at quarries, 4233 were at the iron quarries in Lincolnshire, Leicestershire, and Northamptonshire, where ironstone is worked by open-cut. I believe that the number employed is greater than the above figure, for there are several workings that do not come under the legal definition of a quarry. According to the Act, a 'quarry' is an open working which is at least 20 ft. deep. Of the rest of those employed at the quarries, the numbers are divided quite equally between granite, limestone, sandstone, and clays.

During the last 50 years the precautions taken to ensure safety in coal mines have had a notable effect in minimizing accidents. In 1851 the death-rate among the underground workers was over 5 per 1000, whereas in 1907 the rate was rather less than $1\frac{1}{2}$ per 1000. The death-rate from explosions was 0.057 per 1000 during 1907. It is a rate which varies widely from year to year, owing to the small number of explosions and their varying severity. The highest rate during the last ten years was 0.25, in 1905, when several accidents of unusual severity occurred. The accidents from falls of ground do not vary greatly, the rate being fairly steady at from 0.4 to 0.5 per thousand. The total number of fatal accidents during 1907 was 1283, involving the loss of 1368 lives. Of these, 1195, causing the death of 1279, happened at mines. The number of fatal explosions was 18, by which 44 men met their death. There were also 166 minor explosions in which nobody was killed. The total number of men injured, but not killed, in the 184 fatal and non-fatal explosions was 238. There were 567 fatal accidents due to falls of ground, involving 586 deaths, and 77 fatal accidents in shafts, causing 103 deaths. There were 239 accidents in transportation, killing 246 men, chiefly through being run over. In addition, 146 miscellaneous accidents accounted for 151 deaths. Above ground, 148 accidents involved the death of 149 men. Some indication of the systematic rules relating to safety in mines is given by the number of prosecutions of both masters and men for contravening the rules and regulations. During 1907 the masters' prosecutions amounted to 130, and the convictions to 83. There were 1064 prosecutions of the men, of which 1023 were successful. The greatest number of offenses were connected with riding on mine cars. Then came 103 cases of having matches in their possession while in the mine. There were 81 culprits found with pipes in their pockets, and 73 found sleeping while in charge of a safety lamp.

TORONTO, CANADA.

Miller's Revised Report on Cobalt Geology.—The Provincial Mine.—Activity in Cobalt Stocks.—Visitors to Camp.— Many Important Discoveries. — Explorations in Temagami Reserve. — Brazeau River Coalfields.

The Ontario Bureau of Mines has just published a third edition of the report by Willet G. Miller, provincial geologist, on the 'Cobalt-Nickel Arsenides and Silver Deposits of Temiskaming,' originally issued in 1905, comprising much additional information, especially as regards the working mines of Cobalt and the geological features of the surrounding areas where silver or cobalt occur. Mr. Miller in his preface states that it has not been necessary to make fundamental changes in the description of the geology of the ore deposits, his views as to the relationship of the rocks, the character and nature of the veins, and the economic problems of the camp remaining the same. Much work has been done in the interval, but no new type of orebody has been discovered, with the possible exception of the ore associated with the aplite of the Montreal River area. While both the silver-cobalt ores associated with the aplite of the Montreal River area, and those of the Cobalt area proper, are believed to have been derived from the diabase magma, the aplite ores appear to have come more directly from the magma, and can be classed as of aqueo-igneous origin, the Cobalt ores being of aqueous origin. The report on the Montreal River area by Cyril W. Knight notes the extensive area over which cobalt bloom in small quantities has been found in this region. Many of these small veins differ from the Cobalt type, being aplite dikes having the composition of a granite, but finer in grain, and containing few colored constituents, like mica or hornblende. These aplite dikes are supposed to have been formed by cracks appearing in the diabase as it cooled and contracted; they were subsequently filled with vein or dike material, which probably came from hot solutions given off by parts of the

still molten diabase. Small scales of native silver occur frequently in the aplite. Some of the veins have the same general character as those at Cobalt, but sometimes they contain barite, which is not known there.

The report on the working mines contains a description of the Provincial mine, concerning which little information has been given out. The shaft has been sunk 140 ft., with levels at 65 and 125 ft. On the first level, 450 ft. of driving has been done, and 70 ft. of cross-cutting, and a raise has been put through to the surface, 50 ft. east of the shaft, timber put in, and stoping begun for 90 ft. along the vein. Driving and cross-cutting has been done to the extent of 125 ft. on the lower level, and a raise to the first level has been begun. The plant comprises a 100-hp. return-tubular Jencks boiler, the high-pressure half of a Rand air-compressor, compressing 500 cu. ft. of free air per minute, and a 7 by 10-in. Jencks hoist. Three air-drills are in operation, and 25 men are kept at work under the superintendent, S. Hunter. The noticeable feature of this report is what it omits. No information is given as to the value or prospects of the mine, the character of the veins, the amount of ore taken out or developed, nor the results of the shipments made during the early part of the year. Such information has been repeatedly asked for, the public having a right to know the particulars regarding a government work. It is a question what private interests may be subserved by this secrecy.

In another respect the Provincial Government has been guilty of blundering or worse in regard to a matter concerning the interests of mining investors. Frank Law, wild-cat promoter, after months of delay, was put on trial this week, charged with conspiracy to defraud in connection with the flotation of the Highland Mary Co. of Larder Lake. His counsel, G. T. Blackstock, thereupon moved his discharge on the ground that he had been called as witness in proceedings taken to secure the extradition of his partner, Wm. J. Russell, under a promise of immunity, whereupon Judge Winchester referred the whole matter to the Provincial Attorney General, remarking that the case had been badly bungled by the Government officials. It now transpires that, although preliminary proceedings looking to the extradition of Russell, who was undoubtedly the leading spirit in the conspiracy, were taken in the winter, and the police after a long search succeeded in finding the fugitive at Lima, Ohio, as soon as this was reported to Attorney General Foy, he peremptorily ordered the police to take no further action. The whole business has a singular aspect; but laxity of this kind has lately been characteristic of the administration of justice in this Province.

The interest in Cobalt continues unabated. Shipments are keeping up well, and important discoveries are of frequent occurrence. A prominent feature of late has been the number of visitors. Last week a party of Montreal and Ottawa capitalists numbering about thirty, under the direction of Frank C. Armstrong and W. E. Hidden, of New York, inspected the leading mines, and this week 16 leading Detroit financiers and business men paid a visit to the camp as guests of E. N. Skinner, of New York. Shipments for the week ending September 26 amounted to 578 tons, from the following mines: Buffalo, 31; Cobalt Central, 25; Drummond, 30; La Rose, 73; McKinley-Darragh, 26; Nipissing, 115; O'Brien, 61; Right of Way, 30; Silver Queen, 124; Temiskaming, 30; and Temiskaming & Hudson Bay, 30. At the La Rose the force has been increased to 140 men, and the bluff at the north end of the property is being developed by adits. In adit No. 10 a vein was struck when in 92 ft., on which driving for 200 ft. has been done. The vein shows 4 in. of ore assaying from 3000 to 4000 oz. silver per ton. A winze is being sunk on No. 3 vein on the adit level 50 ft. to the west of the shaft, and large nuggets of native silver have been taken out. Operations were recently started on the University, one of the properties embraced in the La Rose merger, resulting in a rich find in the No. 3 shaft at 22 ft., where two stringers were found with an average width of 2 in. of ore yielding over 4000 oz. silver per ton. At the Chambers-Ferland surface-prospecting last week disclosed three new veins. The Kerr Lake Mining Co.'s annual report gives the output for the year at 1,473,712 oz. silver, valued at $787,554, coming from 528 tons of ore. The cost of producing the ore, exclusive of the cost of the surface-plant, shows a total of $139,530, giving a gross profit of $648,023. Estimating the cost on the basis of an ounce of silver, the metal has been produced for 9½c. per oz. The Nipissing has employed a force of about 100 men during the summer in trenching, with a view to the discovery of new veins, which as found are marked on the map. The company has, in all, over 100 veins known to exist, but not half of them are being worked, the others being kept in reserve until underground development is further extended, when they will be tapped and operated. The Silver Queen, which headed the list of shippers last week, is having the ore on its dump treated at the Muggley concentrator. The main shaft is down 150 ft., and the adit at the 75-ft. level is in over 700 ft. on the main vein to the northwest. In the opposite direction driving has been extended for 350 ft., and a good deal of stoping done. No. 2 vein, 200 ft. north, is being worked by a cross-cut from No. 1, and 200 ft. of driving has been done on it, and ore extracted assaying 4000 oz. silver per ton. At No. 3 shaft, 1000 ft. southwest of the main shaft, a 12-drill conpressor and two 100-hp. boilers have been installed, and a hoist is being put in. At the Coniagas the first 10 stamps of the addition to the concentrating plant have been put in commission. They were manufactured by Chalmers & Williams, each stamp weighing 1250 lb. A nugget of almost pure silver weighing about 100 lb. was found on the 75-ft. level this week. Three veins running from the Nipissing have been discovered on the eastern boundary of Coniagas. The new shaft on the Temiskaming property is down 90 ft. A 20-drill Corliss tandem air-compressor has been ordered from the Sullivan Machinery Co., of Chicago, and a new hoist and additional boilers will also be put in. The O'Brien mine recently struck a new vein 5 in. wide, giving 2800 oz. silver per ton. No. 5 shaft of the Silver Leaf is now 204 ft. down, and driving at the 75 and 135-ft. levels is going ahead. The main vein shows up throughout the shaft, and at the bottom is 5 in. wide, consisting of calcite and silver. A stringer encountered at the 135-ft. level was followed and good ore obtained. A cross-cut at the same depth also struck a 6-in. calcite vein which was driven on for 137 ft. and found to have good silver content. The Right of Way has found additional orebodies, including a 4-in. cross-vein, struck in driving at the 70-ft. level, yielding 4000 oz. silver per ton.

A valuable discovery has been made at the Victoria mine in a shallow pit 50 ft. from No. 3 shaft. It consists of five calcite stringers running parallel, ranging from 1½ to 2 in. wide, carrying native silver. Active operations are being resumed on the Peterson Lake property, where a shaft is being put down on a galena vein recently discovered. A surface force of 20 men is engaged in prospecting and development. The La Rose Consolidated has declared a dividend of 3% for the quarter ending August 31. The Red Rock Mining Co., at a meeting held here on September 28, decided to go into liquidation, having debts of $10,000 which cannot be met. The Company is capitalized at $1,000,000, and the shares have all been issued.

The Otisse property of 40 acres, situated in the Temagami Reserve, six miles west of Elk City, has been sold to E. D. Warren & Co. The outcrop of silver, consisting of decomposed ore filled with silver nuggets, has been traced for 2000 ft. on this property and land adjoining. Development will be begun at once by a force of 25 men, in charge of R. Longley.

BUTTE, MONTANA.

Butte Central & Boston Bankruptcy Proceedings. — Development of Alex Scott Mine.—Deepest Shaft in Butte.

A trustee in bankruptcy has been appointed for the Butte Central & Boston copper corporation, and an effort will be made to re-organize. The company started about a year and a half ago with great promises, backed by capitalists in

London, Canada, Boston, New York, and Butte, among them Lord Templetown of England, Sir Frederick W. Borden of Canada, W. L. Moyer and Orr Lewis of New York, Robert G. McMeekin, Freeman I. Davison, and Charles Howard Weston of Boston, G. E. Blackburn, Lee Mantle, and Alexander Robertson, J. H. Leyson, and B. F. White of Montana. The company started with a heavy over-capitalization, $5,000,000 of preferred cumulative stock and $10,000,000 in common stock, and the only asset the company had was the Ophir mine, purchased for $50,000 in cash and some stock, and another undeveloped mining claim. Only a portion of the capital was issued, the plan being to extend its operations and become a holding company for a number of operating concerns. Its plans failed and the capital was reduced to $7,500,000, which was still too high by at least $6,000,000, in the opinion of mining men. Some development work was done on the Ophir, and the prospects were good. Then the financial crash came, and the company found itself in trouble. It is understood that the claims against the company will aggregate about $158,000, of which $98,827 represent claims held at Boston and $24,998 of unpreferred claims at Butte. A statement of the affairs of

Map of Butte District.

the company is being prepared at Butte. The Ophir is generally considered to be capable of developing into a good mine, under proper management, and it is likely that a reorganized company may succeed.

The Alex Scott mine, of the Butte-Montana Mining Co., is again under development. Eastern men have secured control and have made the first payment of $10,000 on a majority of the individual and treasury stock. The Company owns two claims, the Alex Scott and the Annie, the former being situated next to the West Colusa, one of the Amalgamated's big producers, with which it is connected at the 900, 1000, and 1200-ft. levels. These openings were made by the Butte & Montana Co. for the ventilation of the West Colusa. That Company, in consideration of permission to make the connections, sank the Alex Scott shaft several hundred feet, and it is now down to the 1200-ft. level, the Boston & Montana Co. spending about $65,000 on the work. Nine levels have been opened. By arrangement with the Boston & Montana the Alex Scott has been developed at little cost to the Butte-Montana Co. The shaft has two compartments down to the 900-ft. station, and three compartments below that point. Commercial ore has been found on the 600, 900, 1000, and 1200-ft. levels, and preparations are being made to open them for mining. The Alex Scott, although having a surface area of only five acres, is surrounded by producing mines. The West Colusa lies south of it, the Leonard mine of the Boston & Montana to the east, the Modoc to the north, and the Sunny Side to the west. The Alex Scott has a larger surface area than the famous Minnie Healey mine of the Butte Coalition Co., in the same portion of the Butte district, which has been valued at $10,000,000. The Butte-Montana is capitalized for $1,000,000, in a million shares at $1 par. The Little Annie is a silver property with a surface of 20 acres, situated in the northern part of the Butte district. The officers of the Company are: T. N. Barnsdall, of Pittsburg, president; J. P. Brown, of Butte, vice-president; W. H. Lindsay, of Butte, secretary and treasurer.

The deepest shaft in the Butte district is that at the High Ore mine of the Anaconda Co., which is down 2900 ft. The lowest level is also in that mine, at the 2800, the deepest point at which mining is being done.

KALGOORLIE, WESTERN AUSTRALIA.

Arbitration of Firewood Strike.—Developments in Deep Mines. —Reduction of Output. — Preparing to Treat Large Tailing-Dump.— Decision in Suit for Professional Fee. — July Gold Production.

In my last notes I wrote on the strike of firewood employees, and the probability of the mines closing down. Affairs assumed so serious an attitude that the Chamber of Mines decided to close all mines and mills until a settlement could be reached. For about a week all the mines were shut down, and including those engaged in the fuel industry, some 6000 men were out of work. During the time the men held meetings among themselves, and they were very determined over the matter, the directors of the firewood companies being equally determined for their case, while many wondered what the frequent deliberations of the Chamber of Mines would lead to. Conference after conference between delegates of the fuel companies and those of the employees was held at all hours of the day and night, and still no compromise. At last the Government stepped in, and the Premier was appointed arbitrator. In his award, which is binding till the end of 1910, the men get all they asked for, and to this both sides agreed. It was generally conceded that the wages and conditions under which the men were working were not good enough for such hard work. During the strike period, although so many thousands were out of work, there was no attempt at riot or rowdyism. This sort of thing is absent from all Australian labor troubles. In many ways, the week's stoppage was a good thing for most of the mines, as many shafts were overhauled and timbered where necessary; hoists put in good order, and the reduction plants given proper repair. When in full running order it is the custom in most mills to rush repairs and take chances of running well for a later period. The 'Golden Mile' presented a rather desolate appearance to one who is accustomed to view the place daily. As a rule, one sees hundreds of men in and about the mills; freight and firewood trains are running on the different loop-lines from early morn till night; boiler-stacks give out volumes of smoke, and roasting-furnace stacks plenty of dust, while those attached to concentrate-furnaces belch forth thick sulphurous fumes; there is the rumble of the dry-crushing mills and the roar of the stamp-batteries; and the high belt-elevators pour out their respective loads of residue. All this was absent. But now, happily, everything is in full swing once more.

Further satisfactory developments from the deeper mines are recorded. This time the Ivanhoe in the cross-cut at 1820 ft., has gone through the East lode, which is 44 ft. wide and worth $11 per ton. The Great Boulder main shaft is now down nearly 2400 ft., and a start has been made to open out at 2350 ft. A lode of much promise is being worked from the surface downward in the north end of the Associated, while the diamond drill is searching for the same lode at the 200 and 300-ft. levels.

Some months ago I mentioned the opening of a new

field in the Koolyonobbyn ranges, but results have been disappointing. Save for a little work being done by the original prospectors, the place is deserted. A prospecting party that had set out with good intentions, recently returned to Perth and disbanded. Coupled with these disappointments, it is announced that the Associated Northern mine is to reduce its output to about $30,000 monthly; the Great Fingall is also reducing its yield from $175,000 to probably $100,000 monthly; and the Lancefield mine is shut down for some months to overhaul the plant. The gold yield of the State will suffer a great deal in consequence, and there is little or nothing to make up for the deficiency. A good many accidents have occurred of late, mainly through falling rock. In most cases these are purely accidental, but loss of life is recorded in nearly every instance.

One of the residue heaps of the Oroya-Brownhill Co. contains 750,000 tons of slime from the treatment of sulpho-telluride ore, by wet crushing and bromo-cyanide. This is now being thoroughly sampled by boring and driving a tunnel through the heap. A Cassel plant is working on another lease nearby, and trials are being made on parcels from the dump, with a view to erecting a large plant on the Cassel lines. Metallurgically, there is little or nothing fresh from this centre, excepting a rather interesting case recently fought out in the Supreme Court in Perth. The facts were these: The Ivanhoe management has always stuck to the raw treatment of its ore, and the extraction has never been high, that for 1907, according to annual report, being 87%. The equipment consists of Gates crushers, 100 stamps of 1200 lb. weight, copper plates, classifiers for rough classification prior to concentrating on Wilfley tables, Wheeler grinding-pans, another set of Wilfleys, the pulp from these going to the collecting vats, where the sand is caught and given a double treatment with cyanide. The slime overflows from the above vats and is run into settlers, pumped into agitators, treated with bromo-cyanide, and finally filter-pressed. The concentrate from the Wilfleys is roasted in Edwards tilting furnaces, ground in pans, agitated with cyanide and filter-pressed. This treatment has been adhered to for many years, and not being satisfied with the above extraction, the management borrowed or contracted with E. S. King, of the Oroya-Brownhill mine, to try and improve the extraction of the Ivanhoe. The treatment followed in the Brownhill mill is: Blake crushers, 50 heavy fast-running stamps, no plate amalgamation, rough classification before the coarse sand runs to Wheeler grinding-pans, the overflow from these being classified into coarse and fine, which runs to different Wilfley tables, the pulp from these being again classified, the coarse portion being ground in tube-mills. The slime from all parts is run into V-shaped settlers and thickened, then into agitating vats, treated with bromo-cyanide, and finally filter-pressed. As in the Ivanhoe, the concentrate at the Brownhill is roasted, in this case in Merton extended furnaces, ground in pans, agitated with cyanide, and filter-pressed. The extraction with this treatment is 94%. The ores in both cases are similar. Bewick, Moreing & Co. are general managers of the Oroya-Brownhill and consulting engineers to the Ivanhoe Co. After the Brownhill metallurgist had done certain work at the Ivanhoe, saving, as he reckoned some $200,000, he demanded his fee. None was forthcoming, and as a result he sued the Ivanhoe Co. for $25,000 for services. For the defence, it was stated that the imported metallurgist had done little or no good, that he was borrowed from the Brownhill, which, as before stated, is run by B. M. & Co., that another Brownhill man had done most of the work, that no contract was made, and that the Brownhill treatment to some extent had simply been applied to the Ivanhoe. Several well known Kalgoorlie men testified that they considered that the Brownhill man had done very little, at any rate, $500 was sufficient remuneration. However, in summing up, the Judge said the whole case rested on whether or not a contract had been made. The Ivanhoe management declared that the Brownhill man was there as a servant of the firm of Bewick, Moreing & Co., while the plaintiff said he was there in his private capacity. A great deal of contradiction was apparent on all points. The Judge remarked that "these business men, as they called themselves, did business in a most unbusinesslike manner." Reflections had been cast on the plaintiff's ability, but, said the Judge, "If a man were a fool he might be privileged to write the alphabet backward and forward after his name, and yet remain a fool. Conversely, if a man were naturally clever in his profession, it mattered little whether he had or had not behind him a certain diploma." It may be explained here that several of the witnesses for the defense had A. R. S. M. and other letters after their names, while the plaintiff had not. To conclude, the six jurymen decided that a contract had been made, and was carried out by plaintiff. Damages of $18,000, with costs, were awarded to Mr. King.

J. W. Sutherland, manager of the Horseshoe, has gone to England, by way of India, on three months' leave. Mr. Loring, of Bewick, Moreing & Co., has returned from England by way of Burma. The July yield from the State was valued at $2,800,000; dividends being $1,050,000. The production from the principal mines in July was as given below, all returns being low on account of the fuel strike, and the costs in most cases unusually high.

Name.	Tonnage.	Yield.	Profit.	Dividends.
Associated Gold Mines.	8,417	$90,000	$10,000	$185,000
Associated Northern ..	3,530	37,000	5,000	175,000
Golden Horseshoe	19,275	210,000	76,000	.....
Great Boulder	14,598	225,000	115,000	.....
Great Boulder Perseverance	14,210	100,000	13,000	.....
Great Fingall	22,493	135,000	20,000	155,000
Hainault	5,030	25,000	1,000	.....
Ivanhoe	15,679	170,000	74,000	250,000
Kalgurli	8,080	110,000	55,000	225,000
Kalgurli South	7,779	51,000	1,200*	.....
Lake View Consols....	7,117	52,000	6,000	.....
Oroya-Brownhill	10,637	70,000	15,000	.....
Oroya-Black Range ...	4,332	53,000	20,000	50,000
Sons of Gwalia.....	13,295	91,000	22,000	.....
Sons of Gwalia South..	2,000	24,000	10,000	22,500

*Loss.

MANILA, P. I.

Gold Dredging on Luzon. — Profitable Operations of Paracale Gold Dredging Co. — Dredges Digging 50 ft. to Bedrock. — Ancient Records of Output.—Conditions for Dredging.

The greatest mining success in the Philippines today is the Paracale Gold Dredging Co. with an output of about ₱1400 per diem from less than 400 yd. of dirt handled. On the strength of this the Philippine Gold Dredging Co. has just been organized under the laws of the Philippines, with a capital of ₱200,000, divided into 20,000 shares. Half of this was paid for about 400 acres of land adjoining the Paracale Gold Dredging Co.'s property, where the dredge is now operating. Seven thousand five hundred shares have been sold at par, and the resulting ₱75,000 used to buy the dredge. This leaves ₱25,000 worth of stock in the treasury for emergencies. This stock was all subscribed in two days by Manila business men.

A second-hand Risdon 3½ cu. ft. bucket dredge, which was on the island of Masbate, has been purchased and is now being dismantled for shipment to Paracale. The ladder will be brought to Manila and have a 25-ft. piece set in, as tests show the ground to be 50 ft. to bedrock in places. It is estimated that this dredge will be made ready for digging at a total outlay of not to exceed ₱50,000, including an entire new pontoon 24 ft. longer than the original. The first net return is to go to the stockholders subscribing the ₱75,000; after this all share alike.

The Paracale district takes in all of the territory north of the Labo river, and as far west as the east coast of

Mambulao bay, and is situated in the northern part of the province of Ambos Camarines on the eastern coast of the island of Luzon, P. I. It is reached by steamer from Manila around the southern end of Luzon, and through the San Bernardino strait. Mercedes, the port of call for Daet, is the nearest point at which steamers regularly call at present, which is a four days' trip from Manila. Most of the mining has been, and is now being, done in the northern portion of the district, about 5 miles wide and 10 long, easterly and westerly, with Paracale in the eastern end on the coast, and Mambulao in the western, on the bay. Paracale, lying westerly from Mercedes about twenty miles, is reached by sail-boat, or over an exceedingly bad trail by way of Indan, also in the same district. There are no roads, and even fair trails are unknown in this part of the province.

Streams draining this low hilly country flow in all directions except due south, and the rise and fall of the tide, which is about 5 ft., affects them nearly to their source, making water transportation easy. The Labo and Malaguit rivers, running easterly, are the principal ones, and with their tributaries drain most of the country. Mambulao bay, and the mouth of the Malaguit river, furnish good harbors. Mount Bagacay, in the southeastern portion of the district, is about 3000 ft. high, but shows no mineralization. May Cruz mountain, forming Mambulao point, in the northwest portion of the district, is somewhat over 1000 ft. high. On the southern flank is the old San Mauricio mine. The Anchor adit at Mambulao, with its supposed miles of workings, is thought to run under this mountain.

The remainder of the country is quite flat, with low hills and ridges dividing the tide-water streams. These hills and ridges, except where cleared by the natives for growing hemp, are covered with heavy timber and a dense undergrowth, much of which is armed with spines and hooks. Owing to the frequent heavy showers throughout the dry season the country never gets burned off like Benguet or Masbate, so that prospecting is quite difficult. The country is inhabited by Tagálogs, though there are still a few Bicols left. Occasionally Negritos from the interior mountains are found at work on the small farms, where the chief industry is hemp growing. The rainy season occurs opposite to that at Manila, the heaviest precipitation occurring during December, January, and February, caused by the northeast monsoon.

Geologically the country is mostly hornblende, diorite, schist and gneiss. These are cut by porphyry dikes, usually of the more acid types. The vein systems run northeast and southwest, and stand nearly vertically. The ores are usually white quartz, filled with much pyrite and a little chalcopyrite and galena, and possibly sphalerite and pyrrhotite. The veins mostly follow 'contacts,' in which case there are usually parallel veins in the country. Most of the veins are too small and pockety to pay except as worked by the natives, who place no value on their time. Concentrated by erosion, they have made wonderfully rich placer ground. Gold has been mined here for several hundred years, and many of the main veins of the district can be traced for miles by these old workings, the most of which are caved in. The Anchor adit at Mambulao, now caved, was re-opened by the Philippine Mineral Syndicate for about 1700 ft. The insurrection of 1906 stopped this work before the vein and main workings were reached. No native now living has ever been in these workings, but tradition tells of miles of workings. Tradition also explains the ruins of the old fort on the hill above the mouth of this adit as a protection against the Moro pirates from Mindanao. Government records show an annual output of about $200,000 in the seventeenth century. It is said that Mambulao was then the second city in the island, with a population of 60,000. The natives could work only to a little below water-level. The placer-work was confined to panning and arrastre-work. In 1894 the Spanish Government prohibited mining by natives, and commenced granting concessions to Europeans. A British company, the Philippine Mineral Syndicate, acquired property throughout the district, and have spent upward of 600,000 pesos. Two mills were erected. Work had hardly started when the insurrection broke out. A large amount of money was also spent by the Sociedad Mineral 'La Bonancita,' another English company. The only lode-mining of importance, attempted since 1896, is that recently started to re-open the San Mauricio on May Cruz mountain, the Tumbaga shaft, 3 miles south of Mambulao, and the San Antonio adit, across the Paracale river from the town of Paracale. These all belonged to the Philippine Mineral Syndicate. The San Mauricio was badly caved, but now practically all its workings are accessible. The Tumbaga shaft was found to be only caved to a little below water-level. It is now being pumped out, while the mill is being put in readiness for crushing. The Paracale Gold Dredging Co., Ltd., a New Zealand corpora-

Philippine Islands.

tion, last month extracted 470 oz. gold, valued at 34,920 pesos, from 10,000 yd. of gravel. This Company works on a 25% net royalty to the owners of the ground. Judge T. B. Ingersoll and A. J. MacDonal are the principal owners. This New Zealand dredge has a digging ladder 62 ft. long, with 37 buckets of a capacity of 4½ cu. ft. The pontoon is 114 ft. long by 30 ft. wide, and carries no stacker, but the four 80-ft. sluices, 6 ft. wide, project 30 ft. over the stern. There is no distributer under the screen, and practically all the fine gold is lost, owing to large and varying amounts of water in the sluices, all of which are covered with cocoa matting and expanded metal. The buckets can easily raise 2000 yd. per day, but the sluices can handle only about 400. About a ton of black sand worth $100 per ton, and several tons of rock showing free gold, are also being saved each day. To crush and amalgamate this an old boiler is being rigged up as a tube-mill. A Blake crusher will reduce the rock before feeding to the tube-

mill. Dredging was started within 500 ft. of the sea. Considerable difficulty is experienced by a layer of black sticky mud that balls up in the screen. Over 90% of the dirt passes the screen with 1½-in. holes. The largest nugget so far recovered weighed about 2½ ounces.

A Mr. Wilson has under option over 3000 acres, taking in nearly all of Malaguit river. There is a testing outfit on the ground and another expected soon. Should gold be found in paying quantities it is the intention to install ten dredges. Ground at the head of the Magsimaldo branch of Paracale river, is being tested by shafts, as it is not under water. This ground can either be dredged, or worked by hydraulic elevators supplied by centrifugal pumps. The ground is owned by Manley, Lafferty, and others. There is much more ground, with surface indications as good as the Paracale, that can be obtained on practically the same terms. There is also a great deal of vacant ground in outlying districts still unprospected. The bottom, on which the gold gravel rests, as shown by the dredge, and also by tests in Malaguit river, is ideal, being a soft decomposed gneiss. A dredge for this country should be fitted with an extra boom or two to handle the mangrove stumps.

Inter-island steamers can come within a few miles of any of the properties, and freight unloaded into 'bancas' can be conducted to nearly all of them. There is an abundance of timber for mining operations. Whip-sawed lumber costs on the ground at the rate of 50 centavos for a cut 12 in. wide and 15 ft. long. Mangrove swamps follow tide-water far into interior. This wood makes fine fuel, and can easily be gotten out in 'bancas' and costs delivered 4.50 pesos per cord. Natives receive 80 centavos to 1 peso per day and furnish their own 'chow.' More pay is given on the dredge, as the men become somewhat skilled. Small surface tunnels can be contracted for at 50 centavos per foot.

MEXICO.

Meeting of Congress. — Review by President. — Silent Concerning Mining Laws.—Railroad Rates on Ore and Fuel.—Domestic Coke.

The 24th Congress of the Mexican Republic convened in Mexico City on the evening of September 16, and President Diaz read his annual message to the assembled legislators, the ministers of the cabinet, and an interested public. The message was a lengthy review of the country's condition, but it was remarkably free from suggestions or recommendations of any nature to the Congress, and was almost wholly lacking of interest to the mining fraternity in general. The President stated that the general map of the Republic was progressing rapidly, and that in addition to the work of the Geodetic Survey, the several States were aiding the Federal Government in the completion of this important undertaking; he reported that the total amount of gold and silver coin issued under the new coinage law now amounted to ₱122,000,000; and he called attention to the fact that in the six months under review (January to June) 3600 mining titles had been issued, covering 58,781 *pertinencias*, or 141,000 acres, as compared with 61,000 *pertinencias*, or 147,400 acres, for the preceding six months. The message recited the necessity of aiding the State and mines of Sonora by granting to the Greene-Cananea Con. Co. a concession for the free importation of fuel-oil for a period of years, or until such time as it can be supplied with native oil, in order that operating expenses might be cut to a minimum, and the wisdom of granting the concession seemed to be shown in the great impetus given to mining throughout the State of Sonora immediately upon the resumption of operations at Cananea. In closing, General Diaz said that in spite of the crisis, for which neither the country nor the administration was in any way to blame, affairs had progressed well, and that with peace "we may trust that the prosperity of the Republic will endure and wax greater as the years go by." Whatever inference may be drawn from the fact, it cannot fail to be noted that the President made no reference to the proposed new mining laws which have caused such widespread discussion, nor to the new rates on ores, coal, and coke that are now before the railroad commission. So thorough was the President's review of the country's affairs that his silence on a subject affecting the Republic's most important enterprises could not have been unintentional, and the omission is certainly to be regretted. The mining men of the Republic, however, have not failed to give the subject full consideration, and while they obtained but a rather poor compromise on the question of ore rates, as explained in my former letters, every possible pressure is now being brought to bear on the railroad commission to prevent the admission of the proposed new rates on imported coal and coke. A good idea of the present rates and the proposed increases from the port of Tampico, the main port of entry for these materials, is afforded by the following table:

	Coke, per Ton.	Proposed Increase.	Coal, per Ton.	Proposed Increase.
Bermejillo	₱10.44	₱2.01	₱ 9.44	₱1.01
Chihuahua	11.63	1.31	10.63	0.31
Aguascalientes	8.11	2.36	7.11	1.36
Torreon	9.39	1.89	8.39	1.04
San Luis Potosi	6.76	2.04	5.76	1.04
Monterrey	7.21	2.15	6.21	1.15
Jimulco	10.12	2.22	9.12	1.22
Jiminez	10.99	1.65	9.99	0.65
Mexico	10.50	2.00	9.50	1.00

Of course, the railroads make the usual cry that they are now handling this business at a loss, but it would appear that they have been a long time finding it out. The mining men are the strongest in their objections, for as the smelters are the largest consumers of coal and coke, an increase in the freight will necessitate an increase in smelting charges, which means again that the miner "must pay the freight." Virginia coal and coke is now being delivered at Tampico for ₱8.20 and ₱3.05 per ton, respectively. The domestic product is slightly lower in the matter of coal, and slightly higher for coke. But the supply of domestic coal and coke is insufficient and the quality poor. An average record covering a period of several years gives the following:

COKE.

	Water.	Volatile.	Fixed Carbon.	Ash.
Domestic	1.0	1.0	80.0	18.0
Foreign	2.7	2.0	88.1	7.2

ASH.

	Silica.	Iron.	Lime.
Domestic	55.9	7.9	2.7
Foreign	48.5	12.6	3.6

COAL

	Water.	Volatile.	Fixed Carbon.	Ash.
Domestic	3.0	16.5	61.2	19.3
Foreign	1.5	16.0	76.5	6.0

From this anyone familiar with metallurgical problems can infer that the high percentage of ash in the domestic products, and the higher silica and lower lime and iron in the ash, means the expense of purchasing additional lime and iron, with the consequent increase in the amount of slag made by the furnace and a greater loss in precious metals escaping with the slag. And, furthermore, I have found from my own personal experience that though the domestic coke to all appearance may seem to be equal to the foreign —just as porous and yet firm and strong—nevertheless, for the same carbon content the domestic coke would not, for some unaccountable reason, give the same reduction or metallurgical results as were obtainable with the foreign coke. There are the best of reasons, therefore, why the smelters demand foreign coke and coal, so that the increase in freight of roughly ₱2 per ton means, for a 1000-ton plant, using from 12 to 14% coke on the charge, approximately ₱250 per day added to its running expenses, which, with the extra charges on the coal also, would amount to over ₱100,000 per year. The combined extra expenses of the smelters alone in Mexico would be at least ₱1,000,000 annually, to which must be added that for mines and mills, another million pesos, all of which the miners must pay.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Native bismuth, in crystalline form, exists in the alluvial deposits of the Sinuk and Cripple River placers of the Seward Peninsula, Alaska.

Colemanite (the hydrous borate of lime) has been found in large quantity in the Soledad canyon, near Newhall, in Los Angeles county, California.

Scheelite (tungstate of lime), a heavy, opaque, white mineral, is found in the placers of the Nome region, and collects with the gold in the sluice-boxes.

Aluminum sulphate is produced in such large quantities, and so cheaply, that only under exceptional circumstances could a new competitor enter the field. There is no market whatever for alunite at the present time.

Native copper, cuprite, and chalcocite, all of which are the result of secondary enrichment, are found in a big vein of rhodochrosite (manganese carbonate) in the Tubal Cain mines, situated in the Olympic range, Washington. In depth the secondary minerals give place to copper pyrite.

Antimony is at the moment in small demand, and although quoted at 80c. per unit (that is, for each 20 lb.), at Atlantic tide-water, and 25c. per unit at San Francisco on ore free from arsenic and containing not less than 50% metallic antimony, an unexpected carload of ore would overstock the market. It is used in making type-metal, soft alloys where expansion in setting is required, and in alloys used for anti-friction metal.

Talc is a product of alteration from pyroxene, amphibole, muscovite, and similar magnesian minerals. Its composition is $H_2Mg_3(SiO_3)_4$. It is used for paper making, for linings in stoves, hearths, sinks, and also, ground and molded, as gas-tips. It is used to give a finish to blackboards, and it also gives a fine texture to tinted plastering. It is also employed as tailor's chalk, as a lubricant, and as a dressing for leather.

Bismuth in ore may be determined as follows: The ore is decomposed with HNO_3, and evaporated to fumes with dilute H_2SO_4, the residue filtered off and treated again with HNO_3, diluted, and filtered. The filtrates are combined, and the bismuth is precipitated with H_2S, filtered, and washed. The bismuth sulphide is dissolved in HNO_3, the solution is exactly neutralized with NH_4OH, using methyl orange as an indicator, and then acidified with one or two drops of 30% NHO_3. A large excess of ammonium molybdate is added, and the solution is heated gently until the precipitate collects. It is then filtered and washed with a 3% $(NH_4)_2SO_4$ solution. The precipitate is dissolved in H_2SO_4, passed through a column of zinc (Jones reductor) with suction, and titrated with potassium permanganate.

Specific gravity of cement is a good simple test of the thoroughness of its burning. The specific gravity is determined by immersing a known weight of the cement in a liquid which will not act upon it (usually turpentine or benzine), and obtaining the volume of the liquid displaced. The specific gravity is equal to the weight of the cement (in grams) divided by the displaced volume (in cubic centimetres). The specific gravity of portland cement varies from 3.05 to 3.25, and natural cement between 2.80 and 3.00. The specific gravity of cement decreases with age, owing to the absorption of water and carbonic acid from the air.

Manganese is a common associate of gold and silver ores in many parts of the world. Usually it represents conditions of deposition from solution at no great distance from the surface. This, of course, applies only to cases where manganese is present in notable amounts, for it is seldom entirely absent from any vein. It occurs quite commonly as the pink carbonate, rhodochrosite, and is quite characteristic of the veins in the Telluride district, Colorado. Usually, however, it is crystallized with calcite and ferric carbonate, and later it is released, forming accumulations of black material resembling wad. Where this occurs excessive leaching has generally taken place.

Barite is used to a large extent as an adulterant for white paint. It has a certain advantage as such, because of its absolute unalterableness under ordinary atmospheric conditions. White lead will take up sulphur from the atmosphere of cities, forming lead sulphide, which, being black, gives to the paint a dirty tinge. The barite, however, will remain pure white. As found in nature it usually contains iron, which is leached out from the finely ground product by sulphuric acid, aided by steam. A very fine grade of venetian red pigment is recovered from the leachings. The disadvantage of barite in paint is that it does not mix with the oil as well as white lead, remaining granular, no matter how finely it may be ground.

Coal washing involves the exact reverse of metalliferous mineral concentration. The heavy particles in coal are the deleterious substances which are to be rejected, namely, the slate, pyrite, and 'bone coal.' There is a great variety of appliances used, but the larger amount of coal washing is done with jigs, which are of large capacity and treat the coal at a cost varying from 2½ to 7 cents per ton, according to local prices of labor and supplies. Slate can be more completely eliminated than sulphur, because the latter is present not only as pyrite, but as 'organic' sulphur, that is, combined with the substance of the coal itself. Also pyrite is present to some extent in the form of thin films, called 'scale sulphur,' which remains between the cleavage planes of the coal, and even when broken free will float off with the coal.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Forest Reserve Administration.

The Editor:

Sir—The Forest Reserve has been discussed from time to time in your columns, by geologists, mining engineers, theorists, and lately by the paid employees of the Interior Department itself. The writer, who owns mining property and has been engaged in mining within a forest reserve for the last six years, believes that there are those who would like to know how these theories work out in actual practice on the ground, and how the prospector, the mine-owner, and the home-seeker, are actually affected by this policy, as at present administered.

In the first place, the large corporation appears to have no trouble in Alaska in securing the elimination from a forest reserve of any tract desired. In fact, the relation of these corporations with the Bureau seems to be always smooth and satisfactory. I cannot at this time enlighten your readers as to just how this is accomplished. With the smaller corporation, or individual of limited means, it is different. He must conduct his business, to a great extent, through permission, granted or refused, extended or revoked, according to the momentary pleasure, whim, or fancy of some officer of this Bureau. If, for instance, you wish, within the limits of your claim or elsewhere, to conduct a general merchandise store, for the purpose of supplying a mining camp, and the prospectors and others in the surrounding country, with merchandise, you must first get permission from some officer of the Bureau. The officer can refuse permission altogether if he wants to; or he can require you to furnish bonds of any character and in any amount he may wish. The officer may tax you any amount of money per year he may choose, for letting you conduct your store. Any agreement made between yourself and the officer is binding upon you, but not on the officer or the Bureau, for at any time your permit may be revoked, and you must then step out and leave your improvements, if the officer wishes you to. In short, when you have secured his permission, paid his price, put up your bonds, made your improvements, and put in your stock, you have not that assurance that you will be allowed to conduct your business which would ordinarily be given the victim in a case of private blackmail. This applies to the 'home-seeker' who is so tenderly coddled in the 'Use Book'; it applies to the miner who has to carry his ores across Government land to reach a market; it applies to the prospector who may want to put up a little cabin in which to winter; it applies to anyone who may want to put out a little garden to raise a few vegetables for his own use. The policy is proving to be an industrial blight upon this part of Alaska.

The writer, having implicit confidence in the 'Square Deal,' made a personal appeal to President Roosevelt. The appeal was duly acknowledged, and the result was as follows: an employee of the Bureau was sent from Washington. It was his first trip to Alaska. He immediately began using the local paper and his own tongue, in an effort to offset or to overcome any adverse criticism of the Forest Service. It appears that to each one who went to him with complaints, he expressed genuine surprise, and informed the plaintiff, "Why, you are about the only one who is at all dissatisfied." When he was seemingly overwhelmed with the wrongs which had been done to various parties, and the harm which must result from such despotic authority in the hands of petty employees of a Bureau, he would emerge from the dilemma smiling and confident, with a phrase he seemed to have learned at some one's knee back in Washington. It was this, "So I understand that your troubles, aside from so and so, and so and so," (naming them) "are anticipated rather than real." This was the result of the appeal to the President, and we were forced to conclude that here was a sample of the 'Square Deal' in action. If your readers will study the 'Use Book' and imagine themselves living under the conditions provided therein, they can hardly fail to discover that some considerable space has been devoted to deceit and hypocrisy in this public document. It would seem that the purpose has been to conceal from the general public the discrepancy between the Administration's policy and the policies for which a Republic is supposed to stand; or, in other words, to sugar-coat a pill of despotism for the American people.

Another document was issued by the Administration, June 14, 1907, entitled, 'The Use of the National Forests' (meaning the forest reserves only). Taking page 8 as a sample, we read, "Now, before new forests or additions to old ones are made, all the lands are examined on the ground. The greatest care is used in this work. Every section of land is examined, mapped, and described, and the boundaries are drawn to exclude, as far as possible, everything which does not properly belong in a National Forest. Two very detailed maps are made. One shows just what is growing on the land, the other shows who owns or claims the land. Every bit of cultivated land is located and mapped, as well as the land which is suited to cultivation but which is not cultivated at present."

After this was published, the Tongass Forest Reserve was created. It is situated in a largely unexplored region along the coast range. In a general way it consists of a fringe of timber-covered foothills, fronting upon an arm of the Pacific Ocean and backed by precipitous snow-clad mountains. In this instance (No. 1), "All the lands" were not "examined on the ground." (No. 2) "Every section of land" was not examined. (No. 3) "Every section of land" was not mapped. (No. 4) "Every section of land" was not described. The land has never been sectionized at all. (No. 5) "The boundaries" were not "drawn to exclude as far as possible everything which does not properly belong in a National Forest" (meaning Forest Reserve). (No. 6) "Two very detailed maps" could not be made. There were no data with which to make such "very detailed

maps," and there aren't yet. (No. 7) "One" does not "show just what is growing on the land." (No. 8) The land suited to cultivation is not "located and mapped." And this is only page eight.

Another Forest Reserve was created about the date of this publication at the head of Prince William sound, out of a likewise mountainous, unsurveyed, and largely unexplored country, and the statements are equally false if applied to the archipelago Forest Reserve of southeastern Alaska. Many other falsehoods, half truths, and misrepresentations are contained in this book, and may be found by those who will go over it in connection with the 'Use Book.'

About the time of the publication of this volume of 'romantic fiction' the President made an attack upon what he termed 'Nature Fakirs'. What a pity he failed to find the 'Bigger Game' nearer home while he was in the mood. The killing would have heartened up the 'Square Deal' which used to be such a popular pet. The Nature Fakirs did not use the people's money to print their romances; they were not the paid servants of the people when they wrote their fiction; they were not abusing the confidence and trust of the voters to foist upon the country a form and policy of bureaucracy contrary to the first principles of a Republic.

The miner is willing to pay for timber off Government land, but he objects to being made dependent upon the momentary pleasure, whim, or fancy of some 'sub' of this Bureau, for his timber or for anything else. The prospector is willing to pay the Government for the right to make himself a home, but he is not apt to build a home where his title rests upon the momentary pleasure, whim, or fancy of some 'sub' of a Bureau. The Act of June 11, 1906, was intended to open the Forest Reserve to the home-seeker; but the rights were all conferred upon the Bureau and none upon the home-seeker. So it is really the Bureau's 'sub' in the field to whom the home-seeker must go, and upon whose momentary pleasure, whim, or fancy he must depend for a home within a Forest Reserve. In at least one instance, however, the Bureau's 'sub' proved himself a friend of the home-seeker. About two miles from here an old Indian had cleared a tract of land and made a garden. A 'home-seeker' came along, wanted the old Indian's garden, and by inducing the Bureau's 'sub' to exercise his rare discretionary powers, he got it, in spite of the old Indian's protest. Of course, there was neither justice nor common sense in such a proceeding; but by experience we have learned not to expect justice or common sense, nor even the truth, from a 'sub' of this Beaurocracy; the literature furnished them can hardly be expected to promote truthfulness.

On this Forest Reserve foolish officiousness, financial injury, favoritism, injustice, ignorance, official swagger, and insolence, have all been perpetrated by hirelings of this Bureau upon the people who by their toil and industry are breathing the first breath of industrial life into this 'Silent Land'. The people of Alaska want their timber preserved for the development of Alaska's resources; and until the Forest Reserve was created no timber could be shipped off Government lands, out of Alaska. Under the Forest Reserve, however, "Timber cut from any National Forest" (meaning Forest Reserve) "may be sold in any market anywhere." (Reg. 29, 'Use Book', 1907.)

Now see page 61 of this same 'Use Book': "There is no limit but the capacity of the forest to the quantity which may be sold to one purchaser, except that monopoly to the disadvantage of other users of forest products will not be tolerated." How glad we should be that under any stress of circumstances, this Bureaucracy will decide what is to our advantage or disadvantage in this little matter of monopoly of our timber. The plain truth is that this Bureaucracy, since the creation of the Forest Reserve, can do just as it likes with our timber. It has the authority to let any monopoly skin the land, at any price, in spite of the protests of the people. No falsehood or misrepresentation contained in the literature of this Bureau is more complete or pernicious than the idea industriously and adroitly spread that those who are opposed to the present policy "have selfish designs upon the public domain," or "are opposed to the protection of the public domain from waste and monopoly." To the spreading of this false idea the Bureau owes much of its success in Congress; it seems to be their greatest weapon; and it has been successfully used to stop the ears of the public to the protestations of the victims.

This Administration, in the promulgation of a public land policy, had the advantage of public confidence, public sentiment, ample means, and lavish authority bestowed by Congress; and the result is this policy—despotic, graft-breeding, saturated with deceit, and unbefitting a Republic. If this seem harsh, turn to page 10 of the book issued by the Bureau, and entitled 'The Use of the National Forests' (meaning Forest Reserves). There we read, "Congress has extended the homestead law, slightly modified, to the National Forests." In Alaska the homestead law outside of Forest Reserves allows three hundred and twenty acres; within a Forest Reserve, one hundred and sixty acres only. Is it truth or falsehood to say it is "slightly modified"? In securing a homestead outside a Forest Reserve, the home-seeker's rights are defined by law and precedent; there is no personal favoritism about it. Within a Forest Reserve he can initiate no title, and secure no home, except through the personal favoritism of some member of this Bureaucracy. Further on, same page, we read, "A National Forest, then, does not in the least shut out real settlement. It encourages it." Is this truth, or deception? Would you prefer to make your home under the conditions provided in the 'Use Book', and become subject to the momentary pleasure, whim, or fancy of some 'sub' of this Bureaucracy, or on free land where your rights were defined by law? What is the significance of over three hundred thousand American farmers renouncing their allegiance and going to Canada for homes? Speaking of timber, page 12 reads, "There is no chance for monopoly, because the Secretary of Agriculture must by law sell as much or as little as he thinks best, to whom and at

whatever price he thinks will best serve the interests of all the people." Quite extraordinary, don't you know, and so simple. If only the Constitution were out of the way, he might run the whole Government. "But suppose he should make a mistake?" But he wouldn't, you know; and even if he should, he wouldn't mean to; he is a fine fellow!

But we were looking for deception. There is no such law as stated on page 12 in the above quotation. There never was. Picture to yourself, our senators and representatives enacting and the President signing a law to compel a member of the Cabinet to do just as he pleased. Now the fact is, the law does not say that the "Secretary of Agriculture must"; the law is not mandatory at all in this particular, but it makes our official romance more effective and plausible to say that the "Secretary of Agriculture must". In the 'Use Book' for 1907 geologists and engineers may get some new ideas in regard to the examination of a mineral claim. Read pages 36, 37, and 38. Imagine, if you can, a 'sub' of this Bureau swollen with despotic authority, furnished with these instructions, and even more ignorant of such matters than the person who wrote them! You, who are geologists, engineers, or practical miners, how would you like to have to depend for patent upon the recommendation of such as this? This is precisely the condition which confronts us, and yet "Prospecting and mining are absolutely unchecked," (page 11). "If he wants to get patent to any of them he can do so," and "a National Forest does not affect this work in the least," (page 11). "Do not use the land of an unpatented claim for improvement or construction work which does not tend to the actual development of the claim, consistent with its character, until you have secured a permit from the Supervisor," (page 28). These quotations are all from the book beforementioned, and entitled 'The Use of the National Forests,' (meaning Forest Reserves).

Finally, even the very title of this book is a deception The Bureau has no jurisdiction under the law, over any portion of the National Forests, until the President proclaims, " . . that there are hereby reserved from settlement, entry, or sale, and set apart as a public reservation . . ." The people were not altogether satisfied with the reservation policy of this Administration; so it would seem that in order to overcome the rising tide of discontent it was thought best to give the Forest Reserve an alias, to save its neck. Instead of coining a new name, as is the custom with those who use an alias, it was called 'National Forest'; and now it can no longer be distinguished by name at least, from that part of the timbered public domain, which has not yet been, ". . . reserved from settlement, entry, or sale, and set apart as a public reservation . . ." And furthermore, it will escape some of the criticism and scrutiny it would receive if called by its right name.

Here then, is the policy as viewed from within. Stripped of its cloak of hypocrisy and deceit; deprived of its alias; standing before us in its right name; here is the Forest Reserve as an actuality, not as an ideal or as a theory. Here is where the ideal and the 'Square Deal' fail to track, and here is where truth and righteousness, loyal citizenship, and quickening industrial life, are bludgeoned to death at the altar of despotism. Both the forests and the land should be protected from waste and monopoly. There should be Forest Reserves wherever common sense and modern science indicate their necessity; and if they are administered in harmony with a representative form of government, even the most timid need not fear to call them by their right name. All our timber is not worth the price the common people paid for this Republic, and it is not fitting that there should be taint of despotism or trace of paternalism in the administration of the public domain.

ULYSSES S. RUSH.

Kasaan, Alaska, September 20.

Foothill Copper Belt of the Sierra Nevada.

The Editor:

Sir—I have read with much interest the various letters published descriptive of the copper belt of the foothills, and have gathered much information from them. It seems to me, however, that Mr. Hershey, in his letter published in the MINING AND SCIENTIFIC PRESS of September 5, goes quite too far in trying to make out that another type of deposit than those instanced by previous writers is to be found there. I have a fairly good knowledge of those mines, and I must state that I have never found chalcocite in any such quantity as would constitute a separate type of deposit. In fact, I have never seen undoubted chalcocite in any of the copper-belt mines. There is, to be sure, a small quantity, rising to a few hundred pounds in some places, of an impure and partially decomposed sulphide, which may as well be called chalcocite as anything else, although as a matter of fact it is quite as close to zinc-blende as it is to any typical mineral. Mr. Hershey's conclusions as to the value of the deposits seem to be the same as those at which Lang, Reid, and others have arrived. Consequently the mineralogical character of the copper-bearing minerals is more or less academic. It matters little whether the metal is contained in the ore as chalcocite, as chalcopyrite, or as an oxidized substance, provided that the copper content is there. The portion of the veins or lodes in which any secondarily enriched ore could exist is very limited, not being more than a few feet vertically in any of the mines, and in consequence wo do not find extensive deposits of such ores. There often is found in certain parts of the field a dark soft mineral which in certain parts of the field a dark soft mineral which possesses somewhat the characteristic of chalcocite, but which when tested is found to consist mainly of blende in a state of partial decomposition. Considerable of this is found in several of the southern properties, and at first sight may be taken for a copper mineral, especially chalcocite. I am inclined to believe that Mr. Hershey may have been misled in this particular. The discussion on the copper-belt mines is proving interesting and valuable, but I may suggest it tends to go too much into minutiae. What we want is a statement of economic conditions, and not an essay on mineralogy.

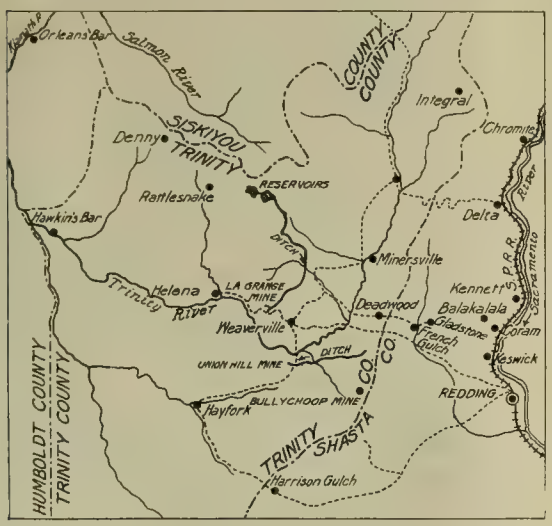
S. W. BENJAMIN.

San Francisco, September 9.

LA GRANGE HYDRAULIC MINE.

Written for the MINING AND SCIENTIFIC PRESS
By DONALD F. CAMPBELL.

The La Grange, the largest hydraulic mine in active operation, is situated in the centre of Trinity county, California, at the southern extremity of Bally Mtn., a range rising to an elevation of 7625 ft. From the divide at the penstock above the mine, the Trinity river is seen three miles to the west at the foot of Oregon gulch, now filled with débris, resembling the terminal moraine of some great glacier, while four miles to the east is Weaverville, the county seat. On the north and west, Trinity county is hemmed in by mountains, and two wagon-roads are the only means of access. There is no wagon-road communication with the Pacific coast, although Humboldt bay is only 33 miles west of the county



Part of Trinity County, California.

line. The principal railway supply-point is Redding, and a daily stage makes the trip of 52 miles in 12 hr. The road passes through the old mining town of Shasta, remarkable for its iron doors and shutters, which suggest the former prosperity of what was once the most important town in northern California. The cost of hauling freight to the La Grange mine from Redding is 1¼c. per lb. and the cost of hauling supplies and rails for riffle-bars is the chief item of expense.

The deposit which is being worked is an old channel running across the divide between Weaver creek and Oregon gulch. It can be traced by the outcrop of the schistose rock forming the north side of the channel. The south side of the channel is a soft shale, separated from the harder rock by a band of clay, which gives considerable trouble in the operation of the mine. Since the deposition of the gravel the strata have been slightly tilted, as shown in the section of the mine (Fig. 1). Near the bedrock the best gravel occurs, together with large boulders. Above this is a band of hardpan, which sometimes requires blasting. This, however, is expensive, and an important economy in operating costs has been effected by keeping the face of the gravel perpendicular, so that the weight is sufficient to disintegrate the cemented material, and thus the pressure from above is used in a way similar to that employed in breaking coal. Above this the gravel is of finer texture but of poorer grade. The entire mass constitutes a bank about 450 ft. high, yielding from 1

Fig. 1. Section Through La Grange Mine.

to 25c. per cu. yd., the average value of the material washed being about 3c. per cu. yd. The gravel deposit is of enormous dimensions, and the operation of the mine will probably be continued for several decades.

The development of an adequate water supply has been the most expensive part of the enterprise. The system includes 21 miles of ditches, 15 miles of flume, with several tunnels, one of which is 2 miles long, and three inverted siphons of 450, 600, and 1100 ft. depression, respectively. Stewart's fork of Trinity river is the principal source of water supply, and this is now being increased in quantity by utilizing the lakes at the head of the river as reservoirs. The main ditch is 27 miles long, of which 8⅝ miles

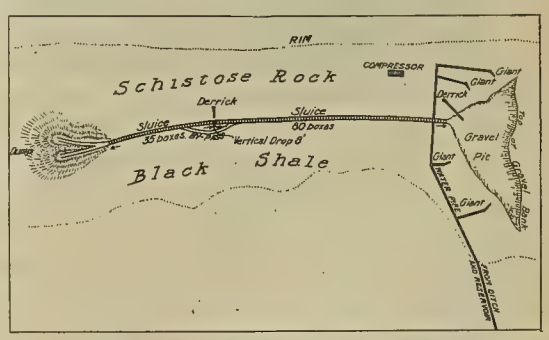


Fig. 2 Plan of Operations, La Grange Hydraulic Mine.

are flume. This is 7 ft. wide at the top, 2 ft. wide at the bottom, with 5-ft. posts. A tunnel 2 miles long penetrates the divide between Stewart's fork and Rush creek. The three inverted siphons, one of which has a depression of 1100 ft., are of pipe from 26 to 30 in. diam. The ditch leads into a reservoir at an elevation of 650 ft. above the mine-workings, and has a capacity of 3000 miner's inches. As this is not sufficient to operate continuously, the water is accumulated in the reservoir above the mine.

The giants are kept at work about 21 hr. per day when there is a good water supply, and during the intervals large boulders are removed and general repairs are made. The economic handling of these boulders is of the utmost importance. Derricks are used in preference to traveling cable-cranes, and as many boulders are removed as possible by this means, and these are piled up on the side of the channel. The derricks are operated by water-power. The larger boulders, especially those out of reach of the derricks, are drilled by hammer machines and blasted.

The giants are worked by hand, but electricity has been tried as a means of control, as it is desirable to place the giant nearer to the bank than is consistent with safety to human life. Magnets were used as a means of control, but the danger of short-circuiting and subsequent turning of the giant was found to be too serious. It is proposed to test a machine directed

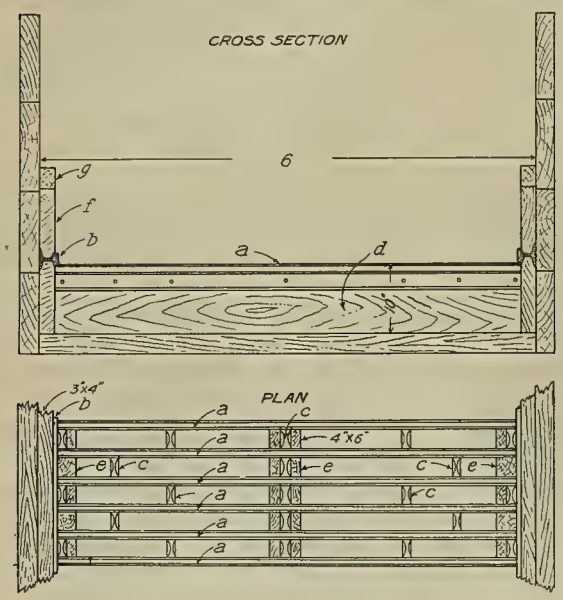


Fig. 3. Illustration of Sluice Lining.

by compressed air, with electrically controlled valves, as a means of working near the bank without danger to the operator. A recent improvement has been made in the giants used by means of which the risk of accident is reduced. Lugs are cast on the giant, to act as a safety-catch if the king-bolt snaps, and the top of the giant breaks off.

At the La Grange mine the gravel is entirely washed down by under-cutting with water, and no large blasts are necessary. The débris is then washed down the sluice-box, which consists of an armored canal, through which a constant stream of enormous boulders and sand is continuously rushing. A few men are kept to tend the boxes and to loosen with steel bars the accumulations of rocks which form in the boxes from time to time. This work is somewhat dangerous, as large boulders are liable to strike the bar and throw the man into the sluice-box, if he happens to be on the wrong side of the bar. If these accumulations are not quickly removed, the entire sluice-box is liable to become filled in a few minutes and overflow. Operations must then be stopped until the box can be emptied sufficiently. The laborers thus employed work 12 hr., and are paid 30c. per hr., the work being wet and disagreeable. In the interval during which the water is shut off these men work at the derrick removing boulders.

The sluice-boxes are 4 by 6 ft., in cross-section, and are let into the bedrock at the bottom of the channel with a uniform grade of 8 in. per 12 ft. As the work advances new 'boxes' are let in, that is, a 12-ft. length is added to the sluice, and the cut in the bedrock is advanced after being thoroughly cleaned up by the giants. On the north side of the mine, the bedrock is hard and easily cleaned, but the south side is a soft shale, and this is less easily cleaned. At the contact a thick blue clay occurs which is very stiff and plastic, and the masses sliding on the bedrock are a serious inconvenience. Of the gold recovered 90% is found in the first 400 ft. of sluice, and the remainder in the next 200 ft. The sluice is armored with steel rails, as the continuous stream of boulders, sometimes 3 or 4 ft. diam., wears out the steel riffles in a few months. The rails are laid close together, at first longitudinally with transverse lugs, being supported on 2 by 6-in. wooden

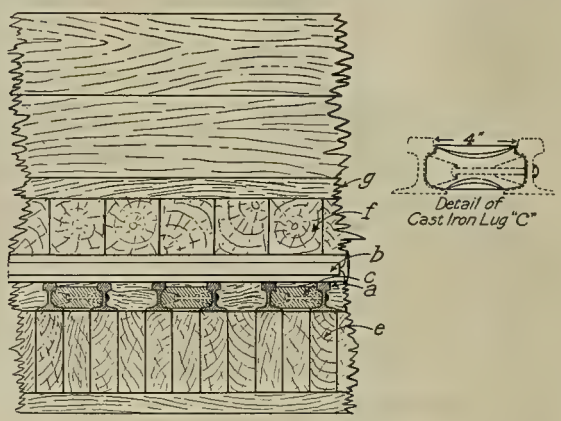


Fig. 4. Longitudinal Section of Side of Sluice.

strips, forming a riffle 10 in. deep. The sluice is continuous, but each length of 12 ft. is called a 'box,' a term derived from the smaller sluice-box of plank. Each box is built of 3-in. lumber, the bottom being lined with rails, and the sides with one rail laid longitudinally, held in place by blocks of wood fitting closely above these. The first 8 boxes, that is, 96 ft., are lined with rails laid longitudinally, held in place by 2 by 4-in. slotted bars. These hold the ends of the rails so that they alternate with one another instead of being directly end to end. Thus any particles of gold that may slide along one rail will fall into the riffle between the next length of rail. The rest of the boxes are lined with transverse steel rails, kept apart by cast-iron lugs, and supported on 2 by 6-in. wooden pieces on edge, kept at proper distance by 4 by 6-in. wooden blocks. These transverse pieces with the blocks attached are kept in stock, and also the rails prepared with lugs. The steel rails used weigh 40 lb. per yd. and are kept apart by 3 and 5 lugs alternately, as shown in Fig. 4. A set of rails wears out in about six months of

steady work. The rails come from the mills cut to 6-ft. lengths and drilled ready for the cast-iron lugs to be bolted on. The latter are made in San Francisco, and weigh five pounds each. One 6-ft. length of rail, with lugs attached, costs $5 delivered.

Great difficulty has been experienced in keeping the rails from becoming dislodged by large boulders. This has now been overcome by the method of lining the sides. At first a block is laid in, shaped to fit close to the web of a rail, and above this a rail is laid longitudinally. This is held down by another block similarly shaped to fit the rail, and above this another block and a longitudinal strip of 3 by 4-in. timber completes the lining. Each of the 130 boxes are 12 ft. long and contain 30 transverse rails. At a point

Giant and Derrick for Handling Boulders.

View Down Sluice From Head.

960 ft. from the head of the sluice-boxes, the débris is thoroughly turned, and the water is churned up by a fall of 8 ft. This ensures the arrest of any gold that may have escaped the upper riffles by flotation. The bottom of the sluice-box at the fall is protected by an accumulation of rocks, and this is provided with a derrick to remove large boulders, and with a by-pass to allow the water to pass in case of a blockade. At 1380 ft. from the head of the sluice a fork is made by which the gravel can be diverted by a steel door to either one of two sluices. In this way the area of dump available is increased, and an alternative is ready when the sluice-boxes become blocked. As work progresses the length of sluice continually increases at both ends, owing to the enormous quantity of material dumped. When the mine is running at full blast, with four giants, the amount of material treated is 1000 cu. yd. per hr. The débris produced each season amounts to several million tons, but this is discarded into the Trinity river, or is deposited on valleys and farms owned by the company. Litigation is thus avoided.

The cost of hydraulic mining by yardage is not easy to determine, owing to the difficulty of estimating the amount of material removed. The only factors that can be accurately measured are the quantity of water and the cost and value of the gold produced, as an accurate survey of a large working-face is expensive and dangerous. It is customary, therefore, to calculate the cost and production per miner's inch of water for purposes of reference. The probable cost per cubic yard can be found empirically from results showing the yardage removed by a known quantity of water during a long period. The season in Trinity county is usually from November 1 to September 1 in a year of average rainfall. Many improvements have been made for decreasing the cost of operation at La Grange, by concentrating the work and by reducing the labor. Great care is also taken to keep the sluice in such condition that it can constantly be run at full capacity. The wear of rails is another serious item of expense, as the 'scrap' is of no value at such a distance from the railway. Various attempts have been made to replace steel rails by various forms of grid-iron castings, and by chrome and manganese steel. A form of riffle-bar and 'chair' of manganese steel has proved the most satisfactory, though the price of this class of steel is nearly prohibitive. Close attention to detail and economy in labor and supplies have made the mining of this gravel, containing but a few cents per yard, into a profitable enterprise which will continue for many years.

IRON, STEEL, AND FUEL IN CHINA.

Written for the MINING AND SCIENTIFIC PRESS
By W. D. B. DODSON.

China has in operation, on modern lines, her first iron mine and reduction plant. Production is not large as yet, but the cost-records established assure rapid expansion of the industry. China will become an important factor in the metal markets of the Pacific countries. Sheng Kung Pao, the wealthiest and most active of China's workers for progress, has just perfected a re-organization of three companies, bringing together the Hanyang Iron & Steel Works, the Tayeh iron concern, and the Pinghsiang collieries, the capital of the new company to be 20,000,000 taels (about $11,600,000). Of this capital 10,000,000 taels has been used in purchasing the properties, and 10,000,000 taels will be employed in extensions and improvements. The property acquired consists of a steel-plant and rolling-mill of 1000 tons daily capacity, furnace-plant of 800 tons capacity, an iron mine now producing more than 1000 tons of ore daily, and a colliery yielding 1000 tons of coal daily, of which latter about 800 tons are coked at the mine. The plant of the company also includes 60 miles of broad-gauge railway, with complete equipment of rolling stock for freight and passenger traffic, 15 miles of narrow-gauge railway and equipment, one 1000-ton steam lighter for river trade, and a big fleet of launches, tugs, barges, and so forth.

I recently visited these properties. It is apparent that the present tonnage will soon be greatly increased. Another furnace of 250 to 300 tons capacity is being added to the reduction plant at Hanyang. One has just been completed, and more will follow. The rolling-mill is now unable to deliver steel rails to supply the demand for the Chinese railways, which are required to give preference to the home company. At the Tayeh iron mine the ore for the Hanyang furnaces is produced, and 150,000 tons per year is shipped to Japan for the Japanese Imperial steel-plant at Wakamatsu. Drill prospecting will be commenced soon to determine plans for installing a big plant for more economical and extensive mining operations. The yield at Tayeh is to be brought up to many thousand tons daily as quickly as the management can attain this end. At the Pinghsiang colliery a coking plant of 4000 tons capacity has been erected, and galleries run in the mine in preparation for a greater production.

A great area of iron-bearing land is owned by the new company. Mining is in progress at Tayeh only. Three big cuts have been made on one vein, and ore occurs between massive limestone on the foot and a diorite hanging wall. At all three cuts, the two most widely separated being nine li (three miles) apart, there is a uniform width of about 60 yd. of ore. Next to the diorite wall an excess of silica is found, but otherwise the full width is mined. Practically all ore taken out is a red hematite of high metallic content, the contract with the Japanese requiring for first grade 62% of iron. A magnetite deposit of rather limited area has been mined on this same ore-seam, adjacent to one of the present hematite cuttings, and ore croppings only have been mined so far, each of the three cuttings being on sharply sloping buttes, the work starting a few feet above the valley level, that is barely higher than the Yang Tse river. A supply for several years of extensive operations is in sight, without pumping, hoisting, or further exploration. One foreign geologist who reported on the property for the Chinese Government estimated a possible output of 1,000,000 tons per year for 100 years. His estimate was based upon the surface showing in croppings for a distance of nearly three miles.

All mining at Tayeh is by hand. Chinese coolies perform all the work, under the supervision of a foreign superintendent. They are paid on an average 250 cash per day, the equivalent of which is about 25c. Mex. or 10c. gold, as exchange rules. One coolie accounts for about one ton of ore daily, making the mining costs about 10c. gold per ton. From the slope-dumps the ore is delivered upon the ore cars, that haul it 15 miles to the Yang Tse river, where it is discharged upon the bank, and then carried by coolies aboard ocean steamships or lighters. The 15-mile railway haul and loading-costs bring the total working-charge against the ore to the time of delivery on board up to about 50c. silver, or 20c. gold. Steam-shovels will soon be installed and modern handling devices adopted.

Tayeh is 80 miles below Hankow, on the Yang Tse river, and 600 miles from the sea. Ocean-going steamships can reach Hankow and Tayeh during five or six months of the year, and the river has 10 to 15 ft. of water at the lowest season. Steamships of 1000 to 4000 tons run alongside the shore, and the ore for Hanyang is loaded into 500-ton barges, which are towed to their destination, 80 miles distant, Hanyang being in the city of Hankow. It is said that the cost of ore charged into the furnace at Hanyang runs as low as 80c. per ton. The Japanese contract for ore was for 30 years, and has been in force less than four years.

Both manganese and lime for the furnaces are secured within a few rods of the ore deposit, and shipped with the ore. Prospecting and development on other iron deposits are to be taken up rapidly. Japan holds forth promise of taking all surplus pig or ore for many years, and will doubtless be the most important consumer outside of the home market.

While the new steel plant was being erected the old furnaces of 500 tons capacity delivered pig for foreign markets. One shipment of 10,000 tons was made to the Atlantic coast of America, and found ready sale. Greater quantities were sent to the American Pacific coast.

The Hanyang steel plant was installed by a Chinese metallurgist of foreign training, V. K. Lee, now general manager of the new company. He traveled through America and Europe, accompanied by experts, testing his own ores and advising with leading metallurgists. The Siemens-Martin process of reduction was decided upon. The steel plant was of the latest type at date of order, in 1904. The molten metal is to be conducted direct from the furnaces to the steel crucibles, and furnace gases used by an

electric power plant, which will supply the Hanyang steel plant with light and some power for the city of Hankow. A 1000-ton steam lighter, specially built for handling rails and structural material, has been put on the Yang Tse by the company to convey the company's products to Shanghai and other river ports. If it is successful, and others are needed, a fleet of five more is to follow. These will enable the company to deliver direct to the largest ocean steamships, when seeking foreign trade.

A modern mining and coking plant has been erected on the Pinghsiang coal mine. Its output can be brought up to 3000 to 4000 tons per day, as the market opens. Extensive development has been carried on, exposing exceptionally strong seams of high-grade coking coal. A beehive oven plant of 4000 tons capacity has been completed. This coke product has proved satisfactory for metallurgical purposes. Japan has been buying considerable quantities, and will be a heavy consumer, as the Pinghsiang product has been able to compete with the best of Japanese products. The coke is now offered to the world, delivered at Shanghai. The 60 miles of broad-gauge railway between the colliery and Siang river—a tributary of the Yang Tse—is good work, and all equipment is modern. From the river-port terminus of the railway to Hankow is a distance of 240 miles, and steam launches towing big barges convey the coke and coal to that city, where it is used by the company or sold to any bidder.

Hanyang's probable output in the near future is difficult to estimate. It will doubtless increase rapidly.

Another modern furnace-plant has been erected in China by the Chinese. It was in Yunnan, and proved a dismal failure, because of ignorance. The enterprise at Hanyang is financed by Chinese capital, but care is taken by a sagacious management to retain experienced foreign help and supervision.

Hunan province, with its great anthracite district and its other minerals, and Shansi, with its vast bituminous coalbeds and iron deposits, are the next districts to command attention. The Peking Syndicate secured a concession to mine in the latter, with a proviso that a smelter should be erected and the people taught. After much wrangling, Shansi province bought the concession back for 3,500,000 taels, and now the great iron district has no other type of reduction plant than the primitive crucible over a coal fire. Hanyang's success under modern methods is expected to stimulate all parts of the empire.

PRODUCTION OF LEAD IN 1907.

The total domestic production of refined lead in 1907, as given by C. E. Siebenthal of the U. S. Geological Survey, was 414,189 short tons, of which 314,241 tons was de-silverized lead and 99,948 tons was soft lead. In 1906 the production of de-silverized lead was 313,886 short tons; of soft lead, 90,783 tons; and the total refined lead was 404,669 short tons. The increase in production of 1907 over 1906 was therefore 9520 short tons. The total for 1907 includes all de-silverized lead produced in this country, and the pig lead recovered from the Mississippi Valley lead ores, but is exclusive of 9910 tons of antimonial lead reported by refineries. Of the pig lead from the Mississippi Valley ores, 29,809 tons was de-silverized, and was therefore not included under 'soft lead.' The product of refined lead cannot be apportioned according to the sources of ore from which it was derived, because the lead refineries treat also products that are secondary and those that are derived from diverse sources. The identity of ore, and thus its original source, is preserved only as far as the smelters. The following table, showing sources of lead produced in the United States, is therefore based on smelter figures. It includes 'pig lead' reported by all known smelters running on Mississippi Valley lead ores and 'lead' produced at all other known smelters in this country. No lead ores from the United States were treated elsewhere in 1907. The table gives the sources of lead produced in the United States, in short tons.

United States:	1906.	1907.
Alaska	8	.....
Arizona	2,884	2,340
Arkansas	.....	15
California	432	854
Colorado	50,497	48,876
Georgia	.....	2
Idaho	117,117	112,569
Illinois	572	498
Iowa	270	225
Kansas	1,932	1,798
Kentucky	44	75
Missouri	111,075	122,856
Montana	2,485	2,035
Nevada	1,669	3,380
New Mexico	640	1,927
Oklahoma	.....	404
Tennessee	11	16
Texas	.....	10
Utah	56,260	61,699
Virginia	.....	82
Washington	46	281
Wisconsin	1,753	3,551
Total from domestic ores	347,695	363,493
Foreign:		
Africa	.....	323
British Columbia	7,238	5,793
Central America	112	.....
China	18	.....
Mexico	48,839	60,247
South America	.....	911
Other countries	.....	149
Total from foreign ores	[1]56,207	[2]67,423
Other sources:		
Zinc residues	2,053	1,318
Undistributed	[3]405	355
Total miscellaneous	2,458	1,673
Total from all sources	406,360	432,589

[1]Exclusive of 12,339 tons lead derived from Mexican bullion.

[2]Exclusive of 9426 tons of lead from Mexican and other foreign bullion.

[3]Including, according to special reports, 25 tons of lead from Texas.

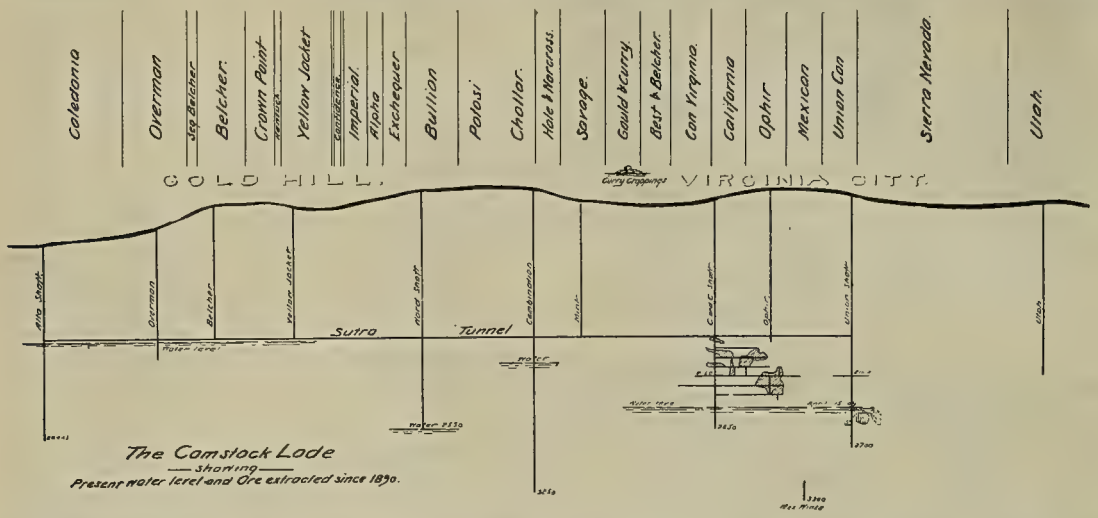
Weight of rail required per mile of track is equal to the weight of one rail, in pounds per yard, divided by 7 and multiplied by 11. The result is the weight in tons of 2240 pounds.

DECLINE AND REVIVAL OF COMSTOCK MINING.—I.

Written for the MINING AND SCIENTIFIC PRESS
By WHITMAN SYMMES.

Comstock affairs are in a ferment. The people who pay the assessments are disgusted with the 'trustee' system and its failure to use their money for real mining. Early in 1908, a few shareholders appeared in the offices, had their stock entered in their own names, and commenced to give a little friendly advice. How much this may mean for real mining on the Lode will be appreciated when it is remembered that (with one brief exception), no shareholder has been in evidence on the Comstock horizon since the days when Mackay, Fair, Jones, and their associates fought the difficulties of deep mining, and retired, defeated, to spend their lately gathered hoards amid the ease of more congenial surroundings. It will not be surprising if the Comstock Lode enters upon a new phase, for it has passed through seven distinct periods already. First came the era of the surface bonanzas, then the lean years when all the mines were sinking through porphyry, and then came the boom of the big bonanzas. Next followed the period of deeper exploration and defeat, which was succeeded by an era of low-grade mining, when the mines were entirely in the hands of the thieving millmen. Then followed a series of degenerate years during which the mines ceased to be mines, but were merely names with which to gamble. But after the long decline there came a slight revival of interest. The Comstock Pumping Association was formed, followed by the Ward Shaft Association; the water in the north-end mines was gradually lowered, and, as a consequence, some orebodies were found. And now, in 1908, the faint-hearted revival is at last given a little vigor by signs of the return of the stockholders, to manage for themselves the reopening of the mines and to put to an end, it is to be hoped, the false pretensions and illegitimate methods of the 'trustee' system.

The era of deep mining, from 1878 to 1886, did not begin under entirely favorable circumstances. The year 1877 ushered in hard times upon the Comstock. There was outspoken discontent with the extravagances and duplicities of many of the managements; by 1879 the California was the only dividend-payer on the lode; assessments were heavy, and the stocks shrunk to small figures. On the other hand, although the bonanzas between the 1000 and 2000-ft. levels had been fewer in number than those near the outcrops, they had yielded several times as much money. From the deeper bonanzas the Consolidated Virginia had shipped nearly $61,000,000 in bullion, and paid its stockholders more than $42,000,000 ($33,000,000 of it was paid within three years). California had shipped nearly $44,000,000 and had paid above $31,000,000. Of the Crown Point and Belcher production, 85% had come from below the 1000-ft. level. Crown Point had shipped nearly $30,000,000 of bullion and paid nearly $12,000,000 in dividends. Belcher had shipped more than $34,000,000 and paid above $15,000,000. The 'mill-ring,' as well as the stockholders, had made huge profits. It certainly seemed worth while to sink another thousand feet. The public, which was contributing the assessments, knew that most of the men who had made fortunes from the mines had backed their faith with their money during those discouraging years from 1864 to 1871, when scarcely a mine had any ore in sight. Sharon, manager of the Virginia branch of the Bank of California, together with Ralston, Hayward, and Mills, had formed their Mill & Mining Co. in 1867 to take over the bank's loan to the mills, at a time when the bank directors insisted that their institution must be relieved of its perilous burden. Mackay had taken his first-won money, which came as dividends from Kentuck, and had invested it in exploring the immense quartz reef in Bullion, of which he became superintendent. He had found nothing there, but plunging again, he and Fair had obtained control of Hale & Norcross on a big slump in 1869. Within two years that mine had paid $728,000 in dividends, and Fair and Mackay, backed by Flood and O'Brien, had paid out their share of the winnings exploring the 1150-ft. level of the Con. Virginia and the California and in buying up control. John P. Jones, superintendent of the Crown Point, had vainly run drifts and cross-cuts through unpromising por-



phyry for nearly three years before he had opened up the Crown Point-Belcher bonanza on the 1100-ft. level. The public knew these things, so it paid the assessments, and the better known mines were enabled to sink their shafts through the second barren horizon.

There were, and are, three conditions affecting deep mining on the Comstock that make the work different from deep mining anywhere else. In the first place, the rock is hot. At a depth of 2000 ft. it originally had a temperature of from 120 to 130° F. Off in the hanging wall, many hundred feet from the main lode, the Combination, Foreman, and Jacket vertical shafts, at about 2000 ft., had temperatures in the dry rock of 118 to 121° F. In consequence of this heat, little exploratory work could be done until drifts and shafts had been linked together into a ventilating system. The 1750 and 1850-ft. levels of the Con. Virginia bonanza at first stood at 108°, and the miners were put to work elsewhere until the ground had been cooled by ventilation. Before connection was made, a few weeks ago, the 2200 drift from Ophir toward the C. & C. shaft stood at 115°, while the Ophir stopes near by, which had some ventilation, were 98° on the sill-floors, and 102° overhead. At the beginning of the deep-mining period, John A. Church estimated that the heat abstracted yearly by the ventilating systems of the lode was equal to the theoretical combustion of 28,601 tons of pure carbon, or as much as would be given off by a steam-heating system burning 55,472 tons of anthracite coal.

Not only is the dry rock hot, but the heat of the water also has to be faced. In July, 1877, the Savage shaft encountered a hot spring below the 2000-ft. station that was 157° F. The water in the Yellow Jacket sump at 3080 ft., in 1880-'82, stood at 170° F. At the present time the Con. Virginia and the Ward shafts have hot water, about 130°, and the latter has reported as high as 160°. When hot springs are encountered, drains must be dug and covered boxes installed, to keep the water from filling the workings with steam. The 2250-ft. level of the Con. Virginia toward Ophir is planked and caulked for several hundred feet in order to keep out the hot water and steam. This form of construction, which is locally known as 'snow-sheds,' is now also being installed on the 2350-ft. level.

General View of Virginia City, Nevada.

Virginia City from the Brunswick Lode.

The third unusual condition in the Comstock is the marked distribution of the water in reservoirs and pockets of water, which have often drowned the pumps for weeks and months at a time. Many mines have water-pockets, but I know of no other district where such an uneven distribution is to be expected. So fearful did the miners become of the water-pockets during the period of deep mining, and so quickly did they turn the drifts aside from ground that was wet, that one wonders whether they were not really prospecting for a dry place in which to work, instead of for ore. The diamond-drill was first introduced for the purpose of exploring for orebodies, but the public would place no reliance in the results. In the words of the Virginia *Enterprise*, the diamond-drill was "considered by many to be a swindling tool, invented by either Jim Fair or the devil." But it was found to be of immense service in giving notice

of approach to the water-pockets, and it came into universal use.

When the mines got down to their 2000-ft. levels most of them were working through the second line of shafts; some of these were inclines, others cut the lode vertically at ten or twelve hundred feet, and were continued thence as inclines. With scarcely an exception, the lower levels were first opened through winzes. At the same time, a third line of shafts was sunk farther east, to cut the lode at greater depth, and to give ventilation and pumping facilities to the suffocating and half-drowned winze system. In no case did an east shaft fulfill the function for which it was designed. Those that reached the lode had no sooner done so than they found more water than their pumps could handle, or than their disgusted and over-grafted stockholders would pay to have removed.

The new Yellow Jacket shaft, to cut the lode vertically at about 2700 ft., was started early in 1877; to meet it drifts were run from the 2300, 2500, and 2700-ft. levels of the old workings, and made an air-connection on the 2300-ft. level in 1879. To the south of the Yellow Jacket, the Crown Point and Belcher put down their joint pump incline to the 3000-ft. level, but, apparently, they forgot something, for they left their main pumps behind them on the 2560. The Belcher found what looked like the top of an orebody on the 2760, and started to get under it on the 3000-ft. level. On the latter level, in 1880, the miners encountered all the water the pumps could handle and the work was practically brought to a stand-still.

On the north, the Yellow Jacket workings connected with those of Confidence, Challenge, Imperial, Alpha, and Exchequer. In 1877, while exploring their 2400-ft. level, the Exchequer men encountered 10 miner's inches of water. The drift was immediately bulkheaded, and the exploration was turned to the west. Possibly they thought that they never would have to contend with that particular body of water again. Some low-grade quartz stringers were cut on the 2400, and in 1880, Exchequer drifted north from the new Yellow Jacket shaft to get under those quartz stringers on their 2810 level. Some more quartz stringers were cut, and then the diamond-drill tapped a flow of 20 miner's inches of water. About the same time a drill-hole from the Yellow Jacket shaft, at a depth of 3080 ft. tapped a heavy flow of water, and the total influx overcame the pumps. By January, 1881, the water had risen above the 2300-ft. level and cut off the last air-connection between the new shaft and the old workings. Crown Point and Belcher, on the south, were flooded too. Alta, a mile away on the southeast fork of the lode, and not directly connected with the Yellow Jacket by any workings, was flooded a couple of weeks later, but probably from an independent source.

The Gold Hill pumps were kept running steadily. Early in 1881 the south lateral of the Sutro Tunnel reached the 'Jacket' shaft, thereby saving the pumps 1514 ft. of lift. By January, 1882, the miners were once more working on the deepest levels, and the Exchequer men were cleaning out their 2810-ft. drift, which had been caved by the flood. The Jacket pumps were then lifting 700 gal. per min. On February 12, 1882, the Exchequer men were back to where their drill had tapped about 225 gal. per min. more than a year and a half before. With the suddenness of an explosion, the miners were struck by a great rush of hot water, and barely escaped with their lives. When the boots were removed from one of them, the scalded skin was torn off too. The water from the drift was estimated at 1350 gal. per minute. The Yellow Jacket shaft was at that time the deepest on the continent, and its pumps were the heaviest that had ever been built. They were compound, steam-driven, Cornish pumps lifting 160 gal. per stroke. By speeding up to 7.2 strokes per minute (which was considered the limit of safety), and by running the bailing-tanks, about 1500 gal. per min. was removed. The water rose rapidly. When it had reached the 2700-ft. level, the influx at the Jacket shaft was estimated at 1900 gal. per minute; when at the 2500-ft. level, 1530 gal.; and at the 2300-ft. level, 400 ft. above the Exchequer drill-hole, it still amounted to 1180 gal. The water flowed south from the Jacket into the 2500 and 2700-ft. workings of the Crown Point, through the 2560 and 2760 of the Belcher, and into the 2275 of the Overman. To the north, the Confidence, Challenge, Imperial, and Exchequer were under water too. At the end of February, the Crown Point-Belcher pumps were stopped. Then came the wrangle between the different companies as to which should pay to pump the water, and what their quota should be. The previous Gold Hill flood had required 18 months of pumping and repairing, but an optimistic estimate was made that the work could be done in six months, at a cost of half a million dollars. Company salaries, office expenses, and general graft were probably not included in the estimate. However, the other companies did not come to the assistance of the Yellow Jacket, and on March 16 the Jacket pumps were shut down, thereby saving that company $15,000 per month. The Bullion mine was not connected with the Gold Hill mines except on its 2150-ft. level; the management paid the Jacket to run its pumps again for a few days, and meanwhile put in a brick bulkhead, thus protecting the Virginia from the flooded workings of Gold Hill. The wrangling over the pumping then went on; Mackay got mad and sold his Yellow Jacket stock, and Gold Hill has been flooded ever since. The Foreman shaft of the Overman, which was then being sunk and had reached a depth of 2300 ft., was necessarily abandoned. There were other reasons than those apparent to the stockholders for the abandonment of the deep-level work. Gold Hill had already entered upon the low-grade era. Its mine managers had discovered that they could transfer larger amounts of the stockholders' money to their own private bank accounts by working the mill game, than by pursuing the work of deep exploration.

Alta conquered its flood of 1882, but in the latter part of 1884 the drifts became very wet. The Gold Hill flood, saturating the lode, had at last reached this mine also. It was found that the Alta pumps

were draining the whole surrounding country. First, they drained the Justice, and lowered the water in Silver Hill 250 ft.; in November, 1884, the water in the Belcher, Crown Point, and Yellow Jacket had been lowered by 300 ft. With both pumps and bailing-tanks running at full speed, 660 gal. per min. were removed, while the influx was about 800 gal. By December the Alta had lost her lower pumps, and the attempt to keep the mine free of water was abandoned.

It was 1879 when most of the north-end mines got to working below their 2000-ft. levels. In that year the Ophir stoped ore from the Hardy vein down to the 2150 level, paying some dividends, and the Union did a little stoping on the 2300 and 2400 levels. The C. & C. shaft reached its 2500 station in January, 1881, but was never sunk deeper. In the spring of 1882, when Gold Hill was finally flooded, the north-end mines were exploring on their 2500, 2700, and 2900-ft. levels. They kept their drifts to the west of the vein formation for fear of water and relied upon drill-holes and a few cross-cuts to explore the formation to the east. The Con. Virginia & California did very little work below the 2000 level. The Union and Sierra Nevada mines did the most, making extensive use of the diamond-drill. Some of the lateral drifts in the north end are said to have been left without a single cross-cut. The Union found some ore on the 2300, 2400, and 2500-ft. levels, the battery-assays running from $30 to $70. The Sierra Nevada also got part of these orebodies, which were at the northern fork of the lode, and not in a promising formation. In 1882 the Mexican stoped some ore on the 2700-ft. level, probably on the same branch fissure as the present Ophir orebody, but at that time it was not considered rich enough to pay. One branch of the Mexican 2500 drift followed this fissure, being 200 ft. below the present Ophir workings, but the mine-map shows but one cross-cut there. Access was obtained to the deeper workings through the Union shaft to the 2700 level and through the Ophir incline, which stopped at the 2500-ft. station. Winzes were sunk to the 2700 level and others to the 2900, and in 1883, the Mexican-Ophir winze, on Mexican ground, was sunk to 3100 ft. In June, 1884, the Mexican, Ophir, Union, and Sierra Nevada united in sinking this winze to the 3300 level, all other work being stopped to save expense. In December, 1884, a diamond-drill hole from the bottom of this winze tapped a large flow of water. The pumps in the winze were utterly inadequate. The flood rose 400 ft. in 90 hours, and the deep levels of the north end were abandoned. By October 1, 1885, the water was up to the 2000-ft. level.

The Comstock Lode was thus flooded at its two extremities, but the middle (Virginia) mines still had access to their deeper workings. The principal shaft in this territory was the Combination, belonging to the Chollar-Potosi, Hale & Norcross, and Savage companies. It eventually reached a depth of 3250 ft. North of it was the Osbiston, belonging to Best & Belcher and Gould & Curry, which was put down 2450 ft.; and south of it was the Ward shaft, belonging to the Bullion and Julia, which reached the same depth. The middle mines first opened their low levels by means of the Fair shaft (and incline) of the Hale & Norcross to the 2400-ft. level, and the Savage incline to 2200 ft. Below that they worked through winzes. Water was abundant, the ground was infernally hot, and ventilation was insufficient for active work. The Combination shaft got a connection to the old workings through the Lightning drift (2000 level) from the Hale & Norcross, in January, 1879. The Savage and Norcross were then flooded in their lower levels. In January, 1882, the Combination started a pump run by hydraulic transmission, at first using steam-power, but later using water-power from the Virginia & Gold Hill Water Co.'s ditch. It was placed on the 2400 station, and discharged into the Sutro Tunnel above. This was to assist the steam-driven Cornish pumps. In 1884 it was found necessary to install another hydraulic pump on the 2600, and sinking was then resumed. A third hydraulic pump was placed on the 3000 level in 1885. As fast as pumps were installed they were found to be working at full capacity. Bulkheads were installed to shut off the wet drifts, drill-holes were plugged. Drifts were kept to the west, for fear of water. There were long delays waiting for new pumps, during which time it was not considered safe to cross-cut from the lateral drifts for fear of getting drowned. Several times the lower stations were flooded for brief intervals. Ventilation was insufficient. The heat was intense. In one drift the miners were pushed to the face lying on a car and surrounded by ice.

Combination, Osbiston, and C. & C. Shafts.

In January, 1885, the Hale & Norcross cut 3 ft. of quartz on the 2800-ft. level, and cut the vein again later on the 2900, where it was 8 ft. wide. It was claimed that it would mill $25 to $35. On the 3000 level the orebody was wider and better. Some ore was stoped out above the 3100-ft. level and yielded

about $5000 in bullion. The orebody appears to have been low-grade, but stringers contained some of the finest 'specimen ore' ever seen on the lode. The formation led north, and Gould & Curry and Best & Belcher thought it worth while to pump out the Osbiston shaft, planning to sink it to 3000 ft. Its lower portion had been abandoned in 1882, and the water stood below the 1800 level. By September, 1886, it had been pumped out and a bulkhead had been finished on the 2319 level to shut out a heavy flow of water from the north. In the latter part of that month the north lateral drift of Hale & Norcross tapped a few inches of water. The Combination pumps were then running at their maximum. Early in the year they had been handling well above 4,000,000 gal. per day, and they were rated at about 5,000,000 gal., or nearly 3500 gal. per min. It became necessary immediately to install another pumping unit. Hale & Norcross and Chollar-Potosi were willing, but the third joint-owner, Savage, refused to contribute. The north-end mines had followed the lead of Gold Hill and gone into milling low-grade ore from the upper levels. Savage had tried it, too, and two months before had commenced to hoist some rich ore from its 600-ft. level. The orebody was being cut on the 800 level and was thought to be large. Real bullion looked good to the Savage directors, and they ceased to take further interest in an exploration of the 3000-ft. level. The stock market was weak and the other two companies could not, by themselves, raise enough money to continue the work. The hydraulic pumps alone were said to be costing $10,000 per month for water-power. In October, 1886, pumping at the Combination shaft was stopped. The 2319-ft. level of the Osbiston shaft was then being cleaned out, preparatory to starting a deep winze in search of a northerly continuation of the Hale & Norcross orebody. As soon as the Combination stopped pumping, the Osbiston was necessarily abandoned too. The fears of Church, Becker, and Lord, in their books published five to ten years earlier, had been fulfilled. The water had conquered. There was no longer any deep mining on the Comstock Lode. But the millmen were getting very busy, as will be shown in the sequel.

The pig-iron production of the United States in 1907 amounted to 25,781,361 long tons, as compared with an output of 25,307,191 tons in 1906 and of 22,992,380 long tons in 1905, according to a report recently published by the U. S. Geological Survey. The smallness of the increase shown by 1907 over 1906 is due to the falling off in demand and production during the last quarter of the year. If the rate of output of the first half of the year had been maintained, the total production of pig iron in 1907 would have been 27,000,000 tons. Of the total amount, Pennsylvania produced 11,348,549 long tons, or 44%, and Ohio 5,250,687, or 20%. Illinois, Alabama, and New York rank next, in the order named.

A memorial window to Sir Benjamin Baker is to be placed in Westminster Abbey by the Institution of Civil Engineers.

CUBAN GOLD MINING.

Written for the MINING AND SCIENTIFIC PRESS
By EDGAR W. DENNISON.

For many years the island of Cuba has been producing copper in considerable quantities. The iron output has also been important. Only recently, however, has the production of gold been sufficient to merit mention. The Holguin-Santiago Mine Co. shipped over $20,000 last month in gold bars. This mine has been taken over by a Cuban company, under the direction of José M. Govin, the editor of the newspaper, *El Mundo*. New installations are contemplated and the chief engineer, W. F. Grey, has recently reported excellent prospects on a number of new claims acquired by the company. The adjoining mine, La Casualidad, has about 30 men employed, under the direction of J. F. C. Abelspies, an English mining engineer. The enterprise has been taken over by Albert Wright, a prominent lawyer of Havana, who is to re-organize the company and raise additional capital for development. A few days ago, at the 85-ft. level, a 14-ft. vein was crosscut, and the assay showed an average higher than any yet found in that district. Another undeveloped mine, on the same vein as the Holguin-Santiago and La Casualidad, to the east, is called Relámpago, while to the east of that is La Caridad, owned in Havana.

The outlook for the early development of gold on an important scale in Cuba is promising. It has always been contended by the natives in the Province of Santiago, in which these mines are situated, that gold was produced in paying quantities many years ago in this same region, the Indians washing it out and using it in trading for provisions.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

E. H., Salmon, Idaho: fine-grained diorite.

J. D., Black Bear, Cal.: No. 1, metamorphic shale with pyrite; No. 2, hornblende andesite.

A. K. B., Latouche, Alaska: metamorphic shale carrying chalcopyrite in films and cracks.

J. R. R., Walkerville, Mont.: No. 1, tourmaline in quartz and a decomposed mineral probably feldspar.

W. B. H., Shasta county, Cal.: No. 4, rock impregnated with cuprite and malachite, and some unaltered chalcopyrite.

C. W. M., Goldfield, Nev.: No. 1, metamorphic rock consisting of feldspar, quartz, and calcite in which are limonite after pyrite, and a black mineral occurring in very thin foliae and dentritic forms in small cracks. The actual amount is so small that from the specimen not enough could be obtained for tests; No. 2, decomposed hornblende andesite.

AN INITIAL COAL-SUBSTANCE WITH A CONSTANT THERMAL VALUE.

By S. W. Parr and W. F. Wheeler.

*From a number of sources there has been developed the idea that in any given type of coal, or perhaps less broadly, in any given deposit of coal, there exists an initial substance with certain uniformities as to composition and calorific value, which might make it serve as a basis for very important considerations, both of a technical and a scientific nature. To be of special advantage, such a unit-substance should be constant within rather narrow limits. Great value will attach to the fact if it may be proved that in any given case there is a unit-coal with fairly definite heat-value. For a given region or mine, for example, where such values were established, it would be possible to calculate heat-units upon the simple determination of the extraneous material such as water, ash, and sulphur. Or it would be possible to correct heat-determinations or confine them within the limits of variation recognized as inherent in the unit-substance. Especially, also, would such a unit-substance serve as a basis for studying losses by oxidation or other processes of deterioration.

Probably the first recognition of such a unit is found in a discussion by Lord and Haas.† From numerous analyses of Pennsylvania and Ohio coals, they draw a comparison between the heat-values as derived by Dulong's formula, the Mauler calorimeter, and those calculated from a unit-value which they designate as 'H' and describe as being the value for the ash, water, and sulphur-free substances. They find the sulphur to be a disturbing element, and correct for it in a partial manner only. However, they are justified in the conclusion that "on comparing the results, seam by seam, it would appear that the actual coal of a given seam, at least over considerable areas, may be regarded as essentially of uniform heating value." The expression 'actual coal,' presumably refers to this same initial or unit-substance, free from extraneous matter, such as ash, moisture, and sulphur. The idea is evidently intended in the further quotation below, though the same qualification as to 'actual coal' is not used. "The results of our tests seem to indicate that the character of a coal seam, as far as its fuel-value is concerned, is a nearly constant quality over considerable areas. The determination of the value for seams would be of great use, as the rapid proximate analysis, or, for that matter, merely the determination of ash and moisture in low-sulphur coals, would be sufficient to grade coals of the same vein. Of course, it is dangerous to argue from so few examples, but the proposition seems reasonable." Kent, in discussing this paper in the same volume (p. 946), says: "The conclusions of the authors that the 'actual coal' (moisture and ash excluded), of a given seam over considerable areas, may be regarded as of uniform heating-value, is one of great practical importance. I have held the same position tentatively for a long time."

Another development of this general idea is found in numerous articles by A. Bement of Chicago. For example,‡ referring to the advantage of having certain units of reference, he says: "The possibility of the more extended use of constants is presented, and the author urges the feasibility of considering the pure coal compositions as constants for a coal seam, or particular locality of such seams. This possibility has been suggested, principally by the fact that the heating power of the pure coal from a general locality does not vary over greater limits than that of the calorimetric method, and he has been able to employ it as a constant in calculating the heating-power of dry and moist coal, having determined only moisture and ash, and obtained results that check with calorimetric determinations made on the same samples. The author, however, does not claim originality in this observation, but does insist that the use of such constants is of advantage. . . . This view concedes that coal from a certain locality or seam does not vary in quality, but that the variation is due to the presence of ash and moisture, which are impurities associated with coal."

It is evident that several variables fail of recognition to the extent that they are not included in the extraneous matter of the vein-substance, and since they certainly do not belong to the 'actual coal,' the question arises as to whether or not we yet have a fair basis of reference for drawing conclusions as to the constancy of our initial coal. For example, in coals of the western or bituminous type, the sulphur may vary from 1 to 5, or even 6%. Variations of 2 or 3% may be possible within the product from the same seam, especially where washing of the coal is in vogue. Now, if this variable is thrown into the 'actual coal' content, it, by so much, prohibits any constancy of heat-values being credited to that hypothetical constituent. The same thing is true of water of hydration. If the shale-constant of the ash has, for example, 8% of such water of hydration, and the same is not counted with the ash, but as part of the 'actual coal,' here again is a disturbing element quite as troublesome as the sulphur. Similar variables would accompany the presence of gypsum or calcium carbonate. The result of extensive investigations has led to the conclusion that such a 'unit-substance' does exist, and consists of the ordinary coal free from moisture, clayey-ash, hydration of the clayey-ash, iron with the necessary sulphur to constitute pyrite, and the remaining sulphur undetermined as to its combinations.

*Abstract from Bull. No. 8, Ill. State Geol. Survey.
†Trans. of the Amer. Inst. Min. Eng., vol. 27, p. 259.

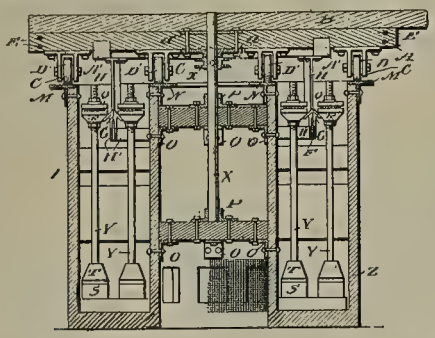
An aluminum carbonate has recently been prepared by M. Gawalowski. At a pressure of eight atmospheres a perfectly soluble polycarbonate is formed. As this pressure exists at a moderate depth in the earth's crust, and the decomposing action of carbonic acid on silicates is known, which are thus transformed into carbonates, the formation of bauxite deposits by thermal springs containing aluminum carbonate in solution can be explained.

‡Jour. Amer. Chem. Soc., vol. 28, p. 636.

MINING AND METALLURGICAL PATENTS.

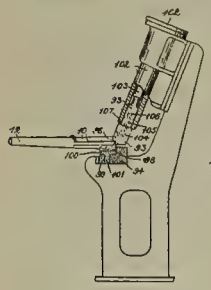
Specially reported for the MINING AND SCIENTIFIC PRESS.

ROTARY STAMP-MILL.—No. 897,214. Philip J. Lonergan, Denver, Colorado.



A stamp-mill, comprising two concentric circular series of vertical stamps and a superposed and concentric turntable extending over all the stamps and bearing on its under side a cam-carrier with a plurality of double-faced cams arranged between the two series of stamps and acting upon the same to lift the stamps of both series, and means for rotating the turntable.

APPARATUS FOR SHARPENING DRILLS OR DRILL-BITS.—No. 897,835. Walter E. Kimber, Johannesburg, Transvaal.

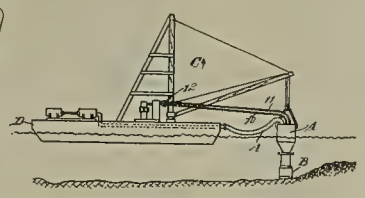


No. 897,835.

In apparatus for sharpening rock-drills or bits, a tool for bringing up the corners comprising a striker having a concave striking face provided with a fluted cutting edge, said face having a groove to receive the upper vertical wing of a drill or bit when the striker is operating on the horizontal wings of said drill or bit to impart the bevel to roughly form the cutting edge, and means for operating said striker, in combination with an anvil formed to hold the drill or bit to present said horizontal wings of the drill or bit to the fluted cutting edge of the tool aforesaid.

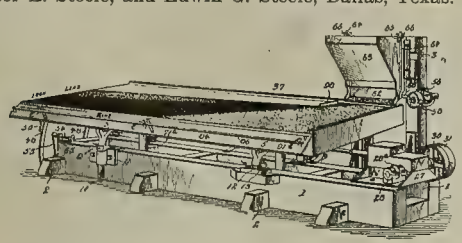
VACUUM MINING DEVICE.—No. 898,927. Jerry B. Riddle, Sacramento, California.

In an apparatus of the character described, a vacuum chamber, a material receiving chamber connected therewith, an upwardly closing valve located between the chambers, and mechanical means whereby said valve is positively opened.



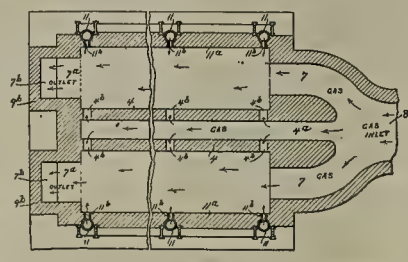
No. 898,927.

SEPARATING-TABLE.—No. 898,020. Henry M. Sutton, Walter L. Steele, and Edwin G. Steele, Dallas, Texas.



A concentrating table having a floor free from obstructions and impervious to the passage of material therethrough, while pervious to air under pressure, in combination with means for passing air through said floor, means for causing the heavier and lighter materials to travel in divergent paths, and separated air-controlling strips secured in contact with the under surface of said floor and disposed to form intermediate continuous air passages extending substantially transversely to the path of travel of the relatively lighter components of the material thereon.

RECUPERATIVE SPELTER-FURNACE.—No. 898,409. Nicholas L. Heinz, La Salle, Illinois.



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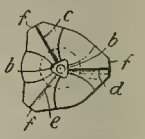


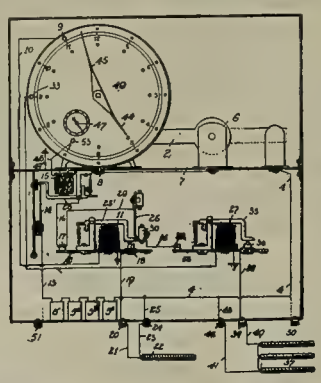
No. 897,336.

The retort chamber having a longitudinal division wall, a gas inlet opening and an outlet opening at opposite ends, near the chamber bottom and at each side of the division wall, a large horizontal flue in the division wall near the chamber bottom and provided with ports at intervals along its length and communicating with the space at the bottom of said chamber on both sides, and a gas supply flue having common connection with the gas inlet openings and large horizontal flue.

ROCK-DRILL.—No. 897,336. Robert H. Anderson, Germiston, Transvaal.

A detachable cutting head for rock-drills, comprising a body portion having a flat base for engagement with a shank, cutting edges disposed upon the face of said body portion, and a stem centrally disposed on said base and forming therewith a rivet-like shaped structure and internally inclined faces in said head forming a hole centrally disposed therein, said inclined faces being provided with grooves, substantially as described.

APPARATUS FOR EXPLODING MINE CHARGES.—No. 898,847. Charles I. Dodson, Pittsburg, Kansas.



In an apparatus for exploding mine charges, a main circuit including a source of electric energy, a normally open switch included in said circuit, a clock having means for automatically operating said switch to close the primary circuit at a predetermined time, a normally open auxiliary circuit, forming part of the main circuit and including said source of electrical energy and the mine charge, said auxiliary circuit being incapable of being closed to fire the charge prior to the closing of the main circuit and means carried by the clock for automatically closing said auxiliary circuit at a time subsequent to the closing of the switch in the main circuit.

Richards Pulsator Jig.

The Richards pulsator jig is similar in almost every respect to the ordinary Harz jig, except that by the use of a peculiar form of pulsating current, one square inch of screen surface can be made to do the work of 200 square inches of screen surface of the ordinary jig. This has been substantiated in one of the largest copper concentrating mills in Montana. After this company had experimented with this one machine, which was of 90 tons capacity, another jig of 400 tons capacity was ordered, and both machines are now in operation.

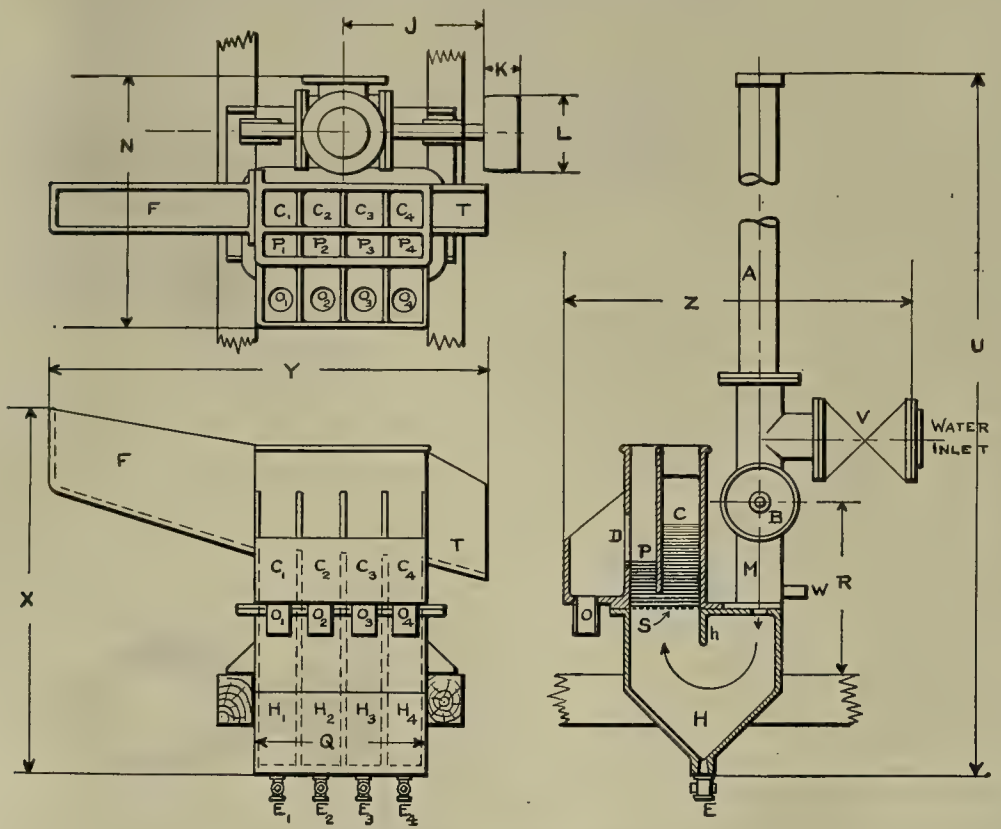
The principal difference between the Richards jig and the ordinary jig is in the absence of plungers and in the fact that there is practically no hutch product made. The advent of the reciprocating concentrating table has demonstrated the manifest advisability of treating the smaller sized ore-particles on such tables, after proper classification, in preference to treating them in jigs. In general, jigs may be used to advantage on ore pulps composed of particles coarser than 1 mm., while particles smaller than 1 mm. should be excluded from the jig-feed and treated on reciprocating concentrating tables. It is not claimed that the Richards pulsator jig can do cleaner work than the ordinary jig, but that it will use much less water and that it occupies a marvelously small space compared to its capacity.

The Richards jig is divided into compartments, in the same way as an ordinary Harz jig; it has a screen dividing the hutch compartment from the upper compartment on which the bed of ore is formed; it has side discharge gates and a tailing discharge, and the compartments are arranged adjacent to each other. In place of the plungers, eccentricts, shafting pulleys, and so forth, which are necessary in the ordinary jigs, the Richards jig has a rotating valve of peculiar design which gives just the right kind of water pulsation to the water.

The total screen surface in the Richards jig is made up of four screens each 4 in. square, or a total of 64 sq. in. for a 90-ton capacity. The Harz jig must have 24 screens, each 17 by 30 in., or a total of 12,000 sq. in., to do equal duty.

The floor space occupied by the 400-ton jig is only 3 by 5 ft., and the screen-surface is only 6 by 14 in. in each of the four compartments. The water used in the Richards jig will amount to 1000 gal. per ton, while in three double four-compartment Harz jigs necessary to handle the same tonnage it will amount to 4700 gallons.

The action of the Richards jig is extremely simple. The figure shows a four-compartment 90-ton Richards jig in plan, elevation, and section. In H will be recognized the familiar form of hutch with diving-board h. The screen is at S, in the same position as in the Harz jig. Likewise the compartments C_1, C_2, C_3, C_4 are above the screen S, and have corresponding pockets, P_1, P_2, P_3, P_4. The dividing plate between P and C reaches not quite down to the screen, thereby acting as a seal or gate for the concentrate. Openings D from P into O are adjustable by vertically sliding gates through which the concentrate discharges into O, thence out to suitable launders.



Plan and Section of Richards Pulsator Jig.

The depth of the 'bed' carried on the ordinary Harz jig will probably average from 4 to 5 in. The bed carried on the Richards jig will average 8 to 12 in. This peculiar feature makes the performance of the machine less subject to fluctuation, with the result that the Richards jig, having once been adjusted for a certain class of ore, may remain unchanged while the ore fed to the jig may be lean or rich, or, in fact, the feed may cease altogether, and the jig will still operate perfectly.

In place of the usual plungers and eccentrics there is connected at the top of the hutch a manifold M, by which water supplied through the valve V is distributed to each of the four compartments of the jig. There are four plug cocks connected to the branch flanges of the manifold. The water from the main supply-pipe, which should be under a head of 30 ft. or more, passes through the gate

valve V to the manifold M under control of the revolving pulsator valve B. The valve B corresponds in function to the plungers in the ordinary jig, yet in its action is radically different in that it gives pulsations of an entirely different character and in one direction only.

The screen S is made up of two layers of brass woven wire cloth, the lower one being 4-mesh and the upper one 20-mesh. In consequence of the fine screen used in this jig a hutch product is seldom made, all the concentrate being discharged in the pockets P_1, P_2, P_3, P_4, and out through D and O. The material fed to the jig enters through the hopper or trough F over the division plates between the compartments C_1, C_2, C_3, C_4, and out at the tailing-gate T. In passing through from F to T the particles are subjected to the jigging action of the upward pulsating current of water through the screen S, with the result that the heavy mineral particles settle in the compartments C_1 to C_4, and the lighter gangue is carried over and out at the tailing-gate T. The heavy particles settle in C_1 to C_4 in the ratio of their specific gravity, that is, the heaviest mineral will be found in C_1 and the lightest mineral in C_4. The discharge of concentrate or heavy mineral is effected by extending the screen, and consequently the jigging action, across under the pockets P. All the particles of both mineral and gangue in C are kept in agitation, the mineral being at the bottom and the gangue on top. The mineral at the bottom flows under the division between C and P into P by reason of the pressure due to the height of the column of material in C. Eventually the height of the material in P would become almost as great as C, but for the gate at D, which allows the mineral from P to discharge. By adjusting the height of the gate D the concentrate from P is discharged as fast as it accumulates in the bottom of C, the flow from C to P being maintained by the difference in head in C and P. This simple method of discharging the concentrate explains why it is possible with the Richards jig to feed lean or rich ore, or to stop the feed altogether, and then start again without readjustment of the machine. The bed of material, which in C may be as deep as 10 in., will cease discharging concentrate as soon as the level of the material in C drops to the level of the gate D. If gangue only is fed to the jig, it then passes over the bed and out at the tailing-gate. If mineral and gangue are fed to the machine, the mineral accumulates in C, disturbs the balance between C and P until a sufficient amount of mineral is discharged at D to compensate for that which came into C. The gangue that came in with the feed is carried over and out at the tailing-gate.

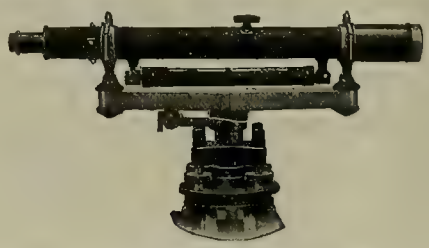
To feed this small machine, which in the 90-ton size has compartments only 4 in. square, to its full capacity means, as one can readily imagine, that the pulp must rush through like water in a mill-race. It seems incredible that the mineral particles can drop to the bottom of the compartments in such a short space of time, but, as Dr. Richards said when questioned on this point, "there you will find them." The enormous capacity of the Richards jig as compared to other jigs—1 sq. in. of screen surface in the Richards jig being equal to 200 sq. in. in other jigs—is due entirely to the fact that the water pulsations are all in the same direction, namely, upward through the screen. There is no suction or back-impulse of water in the Richards jig. This suction in the other types of jig causes a blinding of the screen at every stroke, which reduces the capacity. Inventors have frequently attempted to get rid of the suction formed by the back-stroke of the jig-plunger by inserting check-valves in the plunger, or by using a plunger driving-mechanism giving a quick, slow motion, but with indifferent success. It remained for Dr. Richards to find the correct solution of the problem, and as usual the solution was simple.

The feed to the Richards pulsator jig should be screen-sized to the same ratio of maximum and minimum particles as for successful and efficient recovery upon jigs of the Harz type. The smallest size of material so far treated has been 1 mm. diam. This was done in the 4-in. 4-compartment jig having a capacity of 90 tons per 24 hours. Smaller sizes of jigs have treated still finer material experimentally. The maximum size material as yet treated in the 4-in. jig was 12 mm. (4-10 in.), or coarser than No. 2 mesh.

A simple 4-compartment Richards jig, occupying 8 sq. ft. of floor space, weighing 1500 lb., requires 80,000 gal. water per 24 hr., and uses 1¼ hp., for a capacity of 90 tons, while for similar duty would be needed 3 Harz jigs, each having 4 compartments, occupying 530 sq. ft., weighing 30,000 lb., requiring 425,000 gal. water and 6 horse-power.

A New Wye Level.

We show herewith a new wye level having several improvements, which has just been placed on the market by Wm. Ainsworth & Sons, the well known instrument makers of Denver. The principal parts of the instrument are made of the hardest bronze alloys, with the exception of the centres, which are steel. The telescope is 18 in. long, has a magnifying power of 35, is fitted with an erecting or inverting eye-piece, as desired, and has an objective



1⅝ in. diam. The level tube is 8 in. long, the bar is 11 in., and is provided with clamp and tangential slow-motion screw. The leveling head is of the four-screw type, of the most rigid construction.

Especial attention has been given to the construction of the telescope, where, owing to improved methods, and by working to within limits of 0.00005 in., it has been possible to construct a telescope that will remain in collimation throughout its entire travel, without making use of the objectionable object-slide adjustment, which until now has been the only solution of this difficulty. The wyes are of

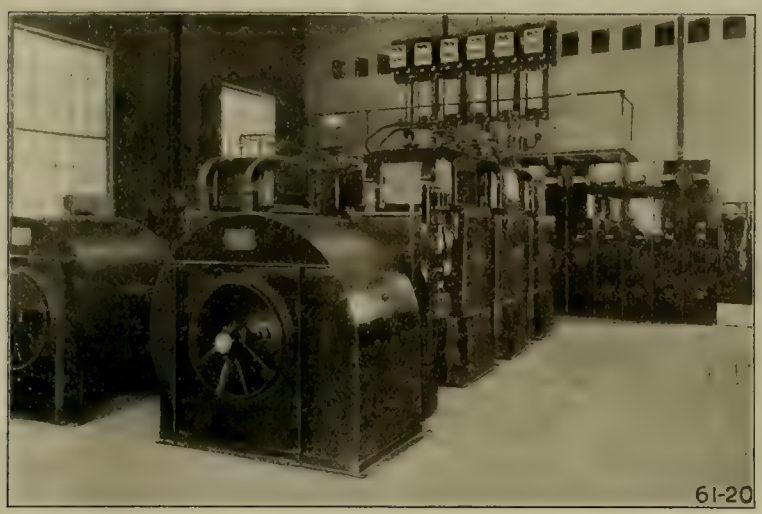
light but rigid construction, with improved spring-latches for locking. The clips carry fibre-tipped spring-plungers that hold the telescope firmly in the wyes. The leveling head is of the same construction as that used for transits, but without shifting centre, and owing to especially accurate construction cannot be clamped in any position. The spindle and clamp are protected against the entrance of dust by a light ring threaded onto the spindle, which car-

ries on its inner diameter a felt ring that is in constant contact with a projecting ring on the clamp. The instrument is packed, with the usual accessories, in a mahogany carrying-case, the telescope being removed from the wyes to prevent damage to the collars when carrying and while in transit. This instrument and an improved railroad wye level are fully described in Bulletin BX-9, which will be sent on request.

Air-Blast Transformers.

The accompanying illustration shows an installation of six 500 kw. Wagner Electric Manufacturing Co.'s air-blast transformers at one of the sub-stations of the Calumet & Hecla Mining Co., Calumet, Mich. It comprises part of an installation of a 500-kw. 2300—13,200 volt, 25-cycle, and a 370-kw., 13,200—480 volt, 25-cycle Wagner air-blast transformer, aggregating 10,830 kw., which has been recently put into operation.

The original installation of Wagner transformers consisted of the six transformers shown in the figure, and of three 370-kw., 13,200—480 volt, 25-cycle transformers. In this transmission scheme, power is generated at 13,200 volt 3-phase, and transmitted to various parts of the property. A large portion of the power is transmitted to the sub-station at Calumet, and is there transformed by the first-mentioned installation of transformers at a transmission potential of 2300 volt for various uses about the mines, such as the operation of pumps, machine tools, and crushers. Another large part of the power, involving the employment of both 370-kw. and 500-kw. transformers, is used in the vicinity of the generating station, for operating motors in the stamp-mills and smelters, and other apparatus above ground, including about 1500-kw. in a new mill lately built about 2000 ft. from the generating station.



View In Calumet Sub-Station, Showing Six 500-Kw. Wagner Air-Blast Transformers.

The generating station is situated at Lake Linden, about seven miles from Calumet, on the property of the Calumet & Hecla, adjacent to its stamp-mills and smelters. The original installation above described proved so satisfactory that a duplicate order, plus an additional unit of 500 kw., was given to the Wagner Co. Up to the present time the entire installation has worked satisfactorily under difficult load-conditions. One unusually severe condition has been that of the frequent starting of the large motors employed on the circuits, which causes occasional extremely heavy over-loads. Another feature that had to be guarded against in this installation has been the frequent occurrence of severe electrical storms. The storm period in this region lasts throughout the summer months. The transformers were subjected to frequent lightning discharges, but have up to the present time successfully withstood them. In one instance the lightning succeeded in getting past the protective devices, and into one of the transformers, but fortunately did no damage beyond burning off a lead, owing to the excellence of the insulation. The transformer was repaired immediately, and was again in service within a few minutes after the occurrence of the discharge.

The illustration shows six of the 500-kw. transformers in the Calumet sub-station. The two blowers, each of which is driven by a Wagner 440-volt, 25-cycle, 7½-hp. induction-motor, are adapted to take care of all the transformers in the sub-station. The view also shows the low-tension distributing circuits, the portion of the switchboard comprising the 2200-volt feeder-circuit equipment, the lightning-arresters, and the apertures in the wall for the admission of the conductors of the 3-phase transmission line from the power station seven miles distant. The construction of the Wagner air-blast transformer presents several interesting features. As an example, attention may be called to one of the 13,200—2300 volt transformers above referred to, the air-passages are so arranged that the air is taken in at the bottom of the coils, and after passing upward through them it is forced by deflecting screens downward around the iron circuit, and is then discharged by a separate passage through the base of the transformer. The shutter in the base of the transformer may be so arranged that in the summer time the warm air may be discharged into an underground duct, and during the winter out into the air of the sub-station, for heating purposes. The transformers are of the shell-type, with pancake coil windings, giving a maximum cooling surface, and at the same time the best disposition of insulation between primary and secondary, and between coils and iron.

Self-Contained Dryer.

The accompanying illustration shows a dryer designed by the C. O. Bartlett & Snow Co., of Cleveland, Ohio, having in view the elimination of brickwork to the utmost possible degree, without sacrifice of heat-economy. Only the fire-box is bricked in. The dryer consists of two cylinders, one

inner and one outer cylinder. The inner cylinder is made tapered, and is entirely self-contained. Near each end of the dryer are securely fastened cast-steel rings, or iron rings with cast-stel tires, resting on rollers or trunnions. There is also girt-gear with pinion and countershaft, and bevel gear with tight and loose pulleys. A fan is provided for taking out the moisture as fast as it is released. The operation of the dryer is as follows: The material to be dried is fed at the front end into the inner cylinder, and passes through the entire length of the inner cylinder, and then drops down to the outer cylinder. It is returned in this outer cylinder, thus traveling twice the length of the dryer, and thereby utilizing the heat to the fullest extent. There are inter-elevators for continually elevating and 'cascading' the material through the currents of heated air. The products of combustion pass in the opposite direction from that in which the material to be dried is traveling, taking up the moisture as fast as released, and out through the fan into the stack.

Commercial Paragraphs.

HENRY EGGERS, who since 1889 has been with McFarlane & Co., is now in the mining machinery department of the Mine & Smelter Co., Denver, Colorado.

THE AMERICAN CHEMICAL SOCIETY announces that in January, 1909, it will start the publication of *The Journal of Industrial and Engineering Chemistry.*

THE DENVER ROCK DRILL & MACH. CO., manufacturers of the Waugh drills, have opened a San Francisco office at 409 Montgomery street. C. S. Wallace is in charge.

The ABBE ENGINEERING CO., New York, announces that it has added a bolting cloth and sifting machinery department to its line of grinding and pulverizing machinery. J. M. Charles will have charge of the new department.

THE CYANIDE PLANT SUPPLY CO., LTD., London, advises us that it is in receipt of unusually favorable reports from the Randfontein installation of Ogle-Ridgway filters. The plant is treating 50 tons (dry weight) of 47% slime pulp per 24 hours, the power used being 5 1-3 horse-power.

The E. J. DU PONT DE NEMOURS POWDER CO. recently entertained a party of operators from the anthracite coal fields of Pennsylvania at its Rapauno works, Gibbstown, N. J. A special train from Scranton carried the party to Philadelphia, from where they went by private yacht down the Delaware river to the plant. The method of testing explosives was explained and an elaborate series of experiments was conducted for the benefit of the visitors.

Catalogues Received.

The JACOBSON MACHINE MFG. CO., Warren, Pa., has lately published a booklet dealing with gas and gasoline engines for electric lighting service.

THE JEFFREY MFG. CO., Columbus, Ohio, has recently issued Bulletin No. 13, which is descriptive of electric locomotives for industrial haulage.

The FORT WAYNE ELECTRIC WORKS, Fort Wayne, Indiana, is distributing its Bulletin No. 1111, showing electric motor drives as applied to machine drills.

The MEESE & GOTTFRIED CO., San Francisco, has lately published Section 9 of its general catalogue, which is descriptive of Butters centrifugal pumps.

The COLORADO IRON WORKS CO., Denver, has lately published its Cyanide Catalogue No. 10B, which is a model in every respect. The catalogue proper is preceeded by a short outline of the cyanide process, intended, as the introduction says, for those who are not familiar with its chemistry and technique. It is particularly lucid, complete, and concise. In the subsequent pages complete cyanide plants, machinery, tanks, and appliances are described, accompanied by adequate illustrations. The publishers of this catalogue have not made the mistake, so common among manufacturing concerns, of slighting the quality of the illustrating material. The illustrations are all original and all good. An index adds much to the usefulness of the pamphlet.

Publications Received.

'THE MINERAL INDUSTRY' DURING 1907. Edited by W. R. Ingalls. Published by the Hill Publishing Co. Vol. XVI. Qto. Ill. 1125 pp. Price $10. For sale by the MINING AND SCIENTIFIC PRESS.

This is the annual compendium of the statistics, technology, and trade of the mineral industry as issued under the auspices of *The Engineering & Mining Journal.* Founded by R. P. Rothwell, and edited successively by the staff of our contemporary, 'The Mineral Industry' has won an assured position as a reliable authority. This volume is as excellent as its fifteen predecessors, and contains the customary reviews on the metal trades by such recognized authorities as W. R. Ingalls, Frederick Hobart, and Floyd Parsons, together with the retrospect on the literature of ore deposits and ore dressing, respectively, by Professors Kemp and Richards. Further comment is not needed. This volume maintains the high standard expected by those familiar with the book, and it remains only to refer to the fact that the editor has issued a circular letter stating frankly that the fifteen preceding volumes "have been published at a financial loss." The price of Vol. XVI is $10. Even at this price it must have active support in order to meet the heavy expenses incidental to careful statistical work. This acknowledgment of financial difficulty is no surprise to those familiar with the enterprise, the cost of preparation, and the limited demand for such an expensive book. We would regret, as will the profession generally, if it prove necessary to suspend publication. A suggestion may be made: 'The Mineral Industry' suffers by being issued from the office of *The Engineering & Mining Journal,* that is, it is part of the publishing activities of a company owning one technical mining paper. In days gone-by when *The Engineering & Mining Journal* was the undoubted leader in technical journalism as applied to mining and metallurgy it was no handicap—but a help—to publish 'The Mineral Industry' by the aid of the same staff and by the help of the same contributors. It was possible to assume that 90% of the information available in America on mining and metallurgical subjects would filter through the pages of the New York paper, for in those days the technical papers in the West were of no consequence. Times have changed. Instead of one reliable journal devoted to mining and metallurgy, we have several on this continent, and it is a fact that a large proportion of the best contributions on technical literature do not go to New York. While we take pleasure in acknowledging the fairness and completeness of the references made by the reviewers in 'The Mineral Industry' to articles appearing in journals other than *The Engineering & Mining Journal,* we are constrained to emphasize the fact that 'The Mineral Industry' does not contain one-tenth of the authoritative comprehensive articles published during the year, and it will fail to do so as long as it is the annex to a single mining paper. We would like to see 'The Mineral Industry' published on its own merits as the recipient of the best available material from all the mining papers, and as a compendium to which the editors of every mining paper could contribute gladly.—T. A. R.

'UNTECHNICAL ADDRESSES ON TECHNICAL SUBJECTS.' By James Douglas. 12 mo. 164 pp. Published by John Wiley & Sons, New York. Price $1.

This is the second edition, with additional matter. Most of Mr. Douglas's addresses have been abstracted in the MINING AND SCIENTIFIC PRESS soon after they were delivered, for we count them among the most thoughtful and informing of the general contributions to technical literature. We are glad to see that the demand for this re-print has warranted a second edition, and we hope that the accomplished author will continue to do further similar service as an educator. Our readers will find this volume a valuable addition to their library and a charming book to carry on a journey.

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EDITORIAL.

A YEAR AGO we published a paragraph concerning the professional engagements of Messrs. Hammond, Beatty, and Yeatman. Our contemporary in New York published a letter denying the accuracy of that statement. Anyone correctly informed concerning the facts today will find that we were either accurate or prophetic. We do not claim to be the latter.

IT LOOKS as if the Yukon fiasco had killed the Lawson-Guggenheim scheme to form a holding company for the Utah and Nevada Copper stocks. We hope this is a fact. Furthermore, we can state frankly that in our opinion the association of Mr. Lawson with the Guggenheim family has hurt their financial credit, not to mention their moral standing. The sooner Lawson is eliminated from mining the better for the industry; nothing but discredit can come from that gas manufacturer.

USUALLY it is more difficult to find ore than to choose a process of treatment, but, according to the statement of the chairman of the Company, the San Francisco Del Oro Mines, Ltd., has 323,304 tons, averaging 26 ounces of silver, 30 grains of gold, 12 per cent lead, and 23 per cent zinc. A dry process failed, but experiments with wet concentration look promising. The ore has a little too much of everything and not quite enough of anything, but if the sampling has been accurately done and the reserves carefully measured, there ought to be money in this ore, and we hope the Company will get professional advice that will result in a profitable realization of these assets.

ACCORDING TO accounts received by us, the Chattanooga meeting of the Institute was a well arranged affair. Capt. H. S. Chamberlain was in charge and is to be credited with the excellence of the arrangements. Among the papers read was one by T. H. Aldrich, Jr., on 'The Treatment of the Gold Ores of Hog Mountain, Alabama,' the author giving interesting information concerning his work upon low-grade material. Messrs. Burchard and Butts described the geology of the Birmingham district by the aid of a balky lantern. The papers of D. H. Newland and H. Foster Bain were read by title. Visits to the new dam, an important engineering undertaking, and to the Rockwood mines were much enjoyed. The weather was fine. The attendance included only 60 visiting engineers, but it was representative.

WE ARE PLEASED to chronicle the inauguration of a geological survey by the State of Virginia. That State ranks eighteenth among its sisters in the American Union in the value of its annual mineral production. It is splendidly endowed

with resources in coal, iron, pyrite, zinc, and nonmetallic minerals, and the prospect of developing a copper industry based upon the low-grade ores of the Virgilina district is one that may be realized. That immediate attention will be given to a study of the economic geology of the State is a reasonable inference from the appointment of Mr. Thomas L. Watson, of the University of Virginia, to the post of director, ably assisted by Mr. J. S. Grasty of the Maryland Geological Survey. Following the wise lead of many other States, the home of the Survey will be at the University of Virginia, at Charlottesville, thus enabling it to ultilize the resources in talent and equipment of a great institution of learning.

WHILE in disagreement with Mr. Hammond concerning professional ideals, we note several useful recommendations in his presidential address. One of them is the suggestion that mining engineers avail themselves of the assistance of local professional men when examining important mines in a district with which they are unfamiliar. Many bad blunders might have been prevented in the past by adopting this sensible idea, and much tribulation has been avoided by the few who adopted it many years ago on their own initiative. We referred to the matter recently, in our issue of September 12. In many districts the distribution of ore is affected by purely local conditions, concerning which a resident engineer is likely to have knowledge; without such knowledge, the examination and appraisal of a mine is apt to be a dangerous guess. Cobalt, Cripple Creek, Leadville, Goldfield, and Chihuahua are some of the many places in which a worldwide experience is likely to go astray, unless aided by some familiarity with geological conditions peculiar to the locality.

IN THIS ISSUE we publish the text of a speech delivered by Mr. Benjamin Ide Wheeler before the Trans-Mississippi Commercial Congress when in session recently in the city of San Francisco. As delivered, this utterance was an oration, both witty and inspiring; even now, in cold print, the address will be found rich in stimulating thought. The president of the University of California, like the Chief Executive whom he quotes, has caught the essential spirit of the breezy West and expressed it in manly fashion. Free air, wide spaces, elbow-room, and mental detachment—these are the dominant features of life in the West. But the most suggestive observation of the orator was the vivid contrast between the mental attitude of the early settlers on the Atlantic seaboard and their successors upon the Pacific slope. Here Mr. Wheeler struck a note that will vibrate in the heart and mind of the Western man. The people that developed the eastern half of this continent cast lingering eyes across the Atlantic, their faces were turned to the homes of their ancestry and their backs to the wilderness stretching far westward; but the men who made the West had cast off their ancient moorings, they had discarded the dreaming head and subjugated feet of Europe, they turned their backs to the long trail over which they had fought across mountain and plain; they faced the sunset; the Atlantic breakers sounded faint, the surf of the Pacific thundered a welcome. Beneath the sentiment is the fact; every year fixes it more firmly; the people west of the Missouri have learned that their life is no antechamber to another existence either in New York or Paris; this spacious land is their sufficient heritage. Their eyes have caught the glow of the setting sun, and in their ears is the song of the Pacific, bringing the promise of commerce with another East, the immemorial East that has become a new West.

THE INTRUSION of journalism into the precincts of mining finance is not new, as our friends in London and New York are aware, to their cost. In London there are fully 80 specimens of the gutter press that fatten on blackmail and backstairs criticism; they constitute a persistent tax on the revenues of the promoter, especially when he is vulnerable. In New York this type of prostituted literature is not so common, simply because people are less prone to take advice from irresponsible editors. But it appears that journalism can aid promotion in another way, more respectable and more insidious. Thus Mr. Julian Hawthorne, possessed of a name familiar to readers of light literature, becomes a director of a company that has stock for sale in a silver mine at Cobalt, Ontario. Mr. Hawthorne has—to use his own words—"dropped literature and taken up the development and exploitation of a mine." He sends letters to professors in universities and other people supposed to be easily lured by meritricious statements promising great wealth, such wealth as would enable a philosopher to publish his book, complete his research, or endow his alma mater. Mr. Hawthorne uses his ability as an artist in words to paint a verbal picture of a silver mine that is unlike any silver mine that ever was, a silver mine that rapacious capitalists are eager to take off his hands, a silver mine that will make the gold mines of Nevada look poor. Mr. Hawthorne and his associates want money to pay for additional ground. Do they ship some of the fabulous ore, do they sell some of their holdings to moneyed men? No, sir. They mean to keep the mine for themselves, they intend to dig their fortunes out of it, they purpose living on the dividends. So says that literary gent, Mr. Hawthorne. Therefore they write to professors who receive small salaries and to other people not wealthy, but possibly gullible. In proof of the value of the mine the intending investor will have the graphic presentments of Mr. Julian Hawthorne, "Author, Journalist and Historian," who is a director of the company that sells the shares, and the report of Mr. Woodford W. Brooks, the president of the company, who quotes "a few examples" of assays. The latter says that "there is no reason why an investment of a few hundred dollars should not return as much in dividends each year." We think that the probabilities are against it, and that the establishment of a literary bureau as an annex to a financial scheme is evidence of a desire to

"take up the development of a mine" in order to facilitate "the exploitation" of the public.

The Engineer as a Financier.

ON ANOTHER PAGE we publish the address delivered by Mr. John Hays Hammond, as president of the American Institute of Mining Engineers, at Chattanooga, Tennessee, on October 1. We take pleasure in publishing this address because it is sure to interest our readers; it is the utterance of a man much in the public view and prominent of late in national politics; moreover, that distorting medium of misinformation, the daily press, has so magnified the salary and other sources of income of Mr. Hammond that his wealth has tended to obscure his position as a professional man, for in these days of reformation it is more difficult than ever for a rich man to enter heaven and a profit is without honor even on the stock exchange. To be frank, we do not agree with the thesis of Mr. Hammond's address; but that is no reason why our readers should be denied an opportunity of becoming acquainted with his views on professional ethics. We rate the utterance of a public man largely according to his sincerity; that is the touchstone by which most speech-making is found to be dross. Applying this test to the address of the President of the Institute, we find it 24 carat, for it is an *apologia pro vita sua*, it defends the code that has guided him in a remarkable career, it asserts the principles of conduct that regulate a group of men to whom it has seemed entirely proper to merge the engineer in the promoter. There is much to be said on both sides; we happen to take the view that participation in company finance undermines professional ethics and that personal speculation in mining shares saps the foundations of professional integrity, but that is the view of one person, possibly of more; at any rate, it is not the judgment of a court of last resort. And as against such old-fashioned ideas, there is much to be said. Mr. Hammond says it, and he says it well. "This is an era of expansion," therefore "the function of the mining engineer has expanded." His "limited usefulness" has gone beyond purely technical reports; he determines the "pecuniary relations of the enterprise" that he investigates. His opinion on geology must be supplemented by a commercial appraisal. Scientific investigation must proceed hand-in-hand with business management. As the mining engineer's field of activity expands, his code of ethics is distended. He does not face a theory, he becomes friendly with a condition. So run the introductory clauses of Mr. Hammond's address. Then he comes to concrete problems, and some of them are as hard as granite. What he says regarding reports made for the seller of a mine is excellent, but we are warranted in doubting whether it be the custom for engineers to state in such a report that it was prepared at the instance of the vendor; most vendors would object. If it be proper to state when a report is made for a seller, it is also proper to make a similar statement when the report is made for a purchaser; in other words, it would be well to make it clear on which side of the fence the engineer's legs are dangling; as a ladylike curate once remarked in our hearing: "What is condiment for the male bird is also condiment for the female bird." Moreover, we are told that reporting for sellers is "undesirable work" for young engineers, because it places them in moral and professional "jeopardy." That is true; but it is also a fact that the young fellows are not always able to choose the task of examining mines for buyers rather than for sellers, and it happens that buyers usually select the older engineers to appraise their possible purchases. And this brings us naturally to the query: If young engineers are apt to over-value mines in the interest of the seller, are old engineers likely to under-value mines in the interest of the purchaser? Such things have happened. The code needs mending here. We could quote cases where engineers have taken pride in acknowledging an under-valuation that enabled their client to get hold of a mine for much less than it proved to be worth. The distinction between "fools" and "sinners" may be slight, as Mr. Hammond remarks, but the distinction between professional honor and commercial honesty still survives.

Next we come to contingent fees. Mr. Hammond's recommendations are excellent, but they are not such as are followed, as far as we know, by any large number of engineers. The idea of giving "full publicity" to "the nature of an engineer's connection" with an enterprise in which he has a contingent interest at the time of making a report, is commendable. We would like to see it put into effect. The first result would be to make prospectuses more interesting. As between payment in stock and payment in money, we see no tremendous difference, unless the stock be made non-transferable. Would not that proviso complicate the transaction to an irremediable degree? Do even engineers of the keenest ethical perception take stock with the idea of holding it indefinitely? Which position is "less vulnerable," that of the engineer who holds for a big price to be paid by a simpleton or that of the man who parts with his shares at a low price before the public has been fooled? To us this acceptance of contingent fees is an ethical tundra; it affords insecure footing and will land the moralizing wayfarer in a cold morass. Mr. Hammond's advocacy of "frank and full publication" of all questionable circumstances calls for hearty endorsement. But it would lead to rather lengthy reports. Even copious foot-notes might be required.

The mention of commissions on machinery and supplies seems almost an anachronism; we supposed such practices were unknown in these days of big salaries and fortunate participations. They belong to the period of small pay when it seemed a venial offence to make a little money 'on the side.' Not many engineers can have been subjected to the temptation mentioned. When it comes, the advice given by Mr. Hammond may be followed to advantage. But there is another complication that is not as rare as it ought to be, namely, the commission on the sale of a mine. Should an engineer

who makes a report on a mine accept a commission from the owner, or should he receive a bonus from the buyer? There also arises the question, by no means academic, whether an engineer is warranted in taking a commission from both parties to the transfer. We are aware of cases illustrating each one of these phases of professional—or unprofessional—conduct. Such transactions have been recorded in the archives of mining and it is fair to add that bad faith has not necessarily been imputed to those that were the beneficiaries. Commissions on machinery are rare nowadays; they are regarded as coarse bribes, and even when mitigated by the courteous exchange of a check to the credit of the engineer's client, they constitute a kind of business generally avoided. But the commission on the sale of a mine is a real evil concerning which the president of the Mining and Metallurgical Society of America should have something to say, because the president of the American Institute of Mining Engineers happens to have overlooked it.

We endorse Mr. Hammond's praise of loyalty. An ounce of loyalty is worth a pound of cleverness. A professional man should remain loyal even when facing the disloyalty of his employer. *Noblesse oblige.* The engineer will "play cricket" in England and "play ball" in America even when his own side seems inclined to disregard the rules of the game.

The expert witness would be in less danger of professional turpitude if he could be labeled aright; we ought to call him a special advocate. He is not a witness in the ordinary sense of the word, he is a specialist who has espoused a cause and is prepared to substantiate a case by presenting observations and arguments for which he is paid. Usually he is prepared to fence skilfully with a cross-examining lawyer and to obfuscate the rudimentary intelligence of twelve farmers. Mr. Hammond quotes Dr. Raymond on this subject; it is fair to say that the association of the name of the secretary of the Institute has honored the avocation of the expert witness to such an extent that criticism of its anomalous duties seems futile. Yet we do not like to drop the subject without repeating a suggestion by no means new, namely: Let the Court select the experts who are to testify, or, if that be impracticable, let the parties to the suit agree on the selection of impartial scientific witnesses whose fees shall be paid on joint account. Then they would cease to be the advocates of one side, they would become unbiased counsellors to the Court and the jury.

Next we come to a large subject: The duty of the mining engineer to the investing public. The recognition of any obligation to the public can only come after complete fulfilment of the trust owed to the client. On the whole, we regard it as inadvisable for the engineer to keep his eye on the supposititious investors, for whom Mr. Hammond shows a proper solicitude. Charity begins at home; duties that are defined are apt to be recognized; it is difficult to serve the widows and orphans, the man on the street, and the rest of the flotsam and jetsam of humanity that gambles on the margin of stocks. But the obligation to a client is specific, and being specific it may be hoped that it will be performed. By strict attention to the interest of his employer, the engineer is most likely to serve the welfare of those who accept that employer as their leader in mining speculation.

Mr. Hammond repeats the advice given by him several years ago to the younger engineers. He deems it well for them to become partners with the capitalists, to develop into promoters, to take a hand in the fascinating but dangerous game of mining speculation and company finance. He is consistent. We thought his advice pernicious when given several years ago in London, and we regard it as pernicious today when he gives similar counsel at Chattanooga. As well might an architect be advised to become a contractor, a practising physician to own a drug-store, a lawyer to form a partnership with the judge before whom he pleads, or a broker to speculate in stocks. The last affords the best parallel. A broker who himself speculates is a dangerous agent; his advice as regards the purchase and sale of shares is likely to be biased by his own dealings in them; his profit may prove to be the client's loss. He may know more about the stock-market than the detached middleman, just as an engineer who dabbles in promotions may be shrewder than the man who keeps aloof from such transactions, but where should the line be drawn? Must it be a line, or should it be a broad parade ground on which every kind of manoeuvre can be comfortably executed? Counsels of perfection are easily derided, but shall we pay any respect to counsels of imperfection? It is true, there are respectable brokers who speculate, and there are honorable engineers who buy and sell mines, promote companies to work them, and gamble in the shares. We do not undertake to make Procrustean rules for our professional brethren, but is it necessary for the president of the Institute to recommend participation in a game that at best is tricky and at its worst is fundamentally unprofessional? We state the case strongly in order to offset the effect of Mr. Hammond's frank justification of the commercial activities that have yielded an immense fortune to himself and his friends.

Mr. Hammond disclaims authority for his remarks, and modestly denies that he is offering "an official and representative declaration of principles." At the risk of seeming discourteous, we insist that this is just what he has done, for he speaks as the president of the Institute. Hence the serious attention we give to his utterance. Moreover, whatever he has to say on these matters is given weight by his political prominence, his undoubted fame as a financier, his unquestioned successful application of the principles he advocates. We deem them contrary to the best interests of the profession. A promoter may "in a high and worthy sense of that term" be a good citizen, not infrequently the community owes much to his initiative, but his essentially commercial code cannot be *grafted* upon any professional ideal without bringing forth fruit of a highly variegated character.

Personal.

HENRY BRATNOBER is here.

ALBERT BURCH is in Mexico.

W. P. HAMMON is at Boston.

FRANK W. OLDFIELD is in Arizona.

R. H. CAMPBELL has gone to Seattle.

EDGAR A. WILTSEE is in San Francisco.

H. H. WEBB is here, on his return from Mexico.

CHARLES JANIN was married at Berkeley on October 7.

L. T. HOHL has returned to San Francisco from Colombia.

GEORGE W. MAYNARD has been examining mines in Colorado.

S. F. SHAW will be at Bodie, Cal., during October and November.

JAMES S. WYATT is inspecting possible dredging ground in Wyoming.

RICHARD A. PARKER has returned to Denver from New York and Boston.

WILLIAM A. HEYWOOD is expected in London upon his return from Chile.

WILLIAM FORSTNER is examining oil lands in the Coalinga district, California.

F. F. SHARPLESS was at Kansas City last week, on his return from Sonora, Mexico.

ALFRED VON DER ROPP, who now lives at Geneva, in Switzerland, is in San Francisco.

J. S. CAMP has opened an office for engineering and surveying at Cottage Grove, Oregon.

E. C. LIMBACH is superintendent of the Washington Meteor mine, at Blewett, Washington.

J. P. FOX, former superintendent of the North Pole mine, at Bourne, Oregon, has moved to Seattle.

A. CHESTER BEATTY has been making a tour in Arizona and Utah, with Charles Hayden, of Hayden, Stone & Co., Boston.

BENJ. B. LAWRENCE returned recently from Cobalt, Ontario. He is consulting engineer to the Kerr Lake Mining Company.

A. VAN DER NAILLEN, of the School of Practical Engineering, at Oakland, left on October 3, on a journey to Europe. He will be absent four months.

CORTLANDT E. PALMER left New York on the 12th inst., upon a tour of inspection of Pinguico, Peregrina, and Mexican Milling & Transportation Co. properties, at Guanajuato, Mexico, and of the Esperanza property, at El Oro.

Obituary.

JOHN EDMUND HAWORTH was stabbed to death on September 24, by a workman discharged by him as manager of the Ponderosa mine, in the Province of Huelva, Spain. He was a man with an honorable record as a mining engineer in many countries, and an associate of the Royal School of Mines. His tragic death will distress many friends.

A. ARTHUR ABBOTT, a graduate of the Houghton School of Mines (class of '93), died at Bellevista, near Callao, Peru, after a short attack of *verrugas*. Previous to going to Peru, he had practised in California, Montana, and South Dakota. In Peru he was first employed with the Cerro de Pasco Mining Co., leaving their employ, as superintendent of mines, to engage in private work. At the time of his death he was consulting engineer for the Peruvian Mining, Smelting & Refining Company.

Dividends.

On October 26 the Homestake Mining Co. will pay its monthly dividend of 50 cents per share on a capital of 218,400 shares of $100 each.

Latest Market Reports.

LOCAL METAL PRICES—October 15.

Antimony	12@16c	Quicksilver (flask)	$43@44
Casting Copper (scrap)	8½@13½c	Spelter	6¼@7¼c
Pig Lead	4.65@5.60c	Tin	32@33¼c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Oct. 8. £. s. d.	Oct. 15. £. s. d.
Camp Bird	0 13 0	0 13 6
El Oro	1 5 0	1 5 0
Esperanza	3 4 4½	3 8 9
Dolores	1 10 0	1 10 0
Oroville Dredging	0 11 0	0 9 9
Stratton's Independence	0 1 0	0 1 0
Tomboy	1 2 6	1 1 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Oct. 9	13.25	4.43	4.78	51⅜
" 10	13.25	4.43	4.78	51⅜
" 11	Sunday.	No market.		
" 12	13.25	4.43	4.78	51⅝
" 13	13.25	4.43	4.75	51⅝
" 14	13.25	4.38	4.75	51⅝
" 15	13.25	4.38	4.83	51⅜

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Oct. 8.	Oct. 15.
Amalgamated Copper	74¼	76
American Smelting & Refining Co.	85⅜	87⅜
Boston Copper	13⅝	14
Butte Coalition	24	24¾
Cumberland Ely	7¼	7⅝
Dolores	7	6¾
El Rayo	3½	4
Giroux	4¼	3⅞
Greene-Cananea	10	10
Indiana Sonora	5	5
La Rose	6¼	6½
Miami Copper	10	9⅞
Nevada Consolidated	15⅞	16⅜
Newhouse	5⅛	5
Nipissing	8	8⅛
Ohio Copper	3	3
Tennessee Copper	40½	42⅞
Utah Copper	40½	41½
Yukon	4	4½

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, October 15.

Atlanta	$ 21	Laguna	$ 1.10
Belmont	1.20	MacNamara	56
Booth	41	Manhattan Con	5
Columbia Mtn	22	Midway	30
Combination Fraction	1.20	Montana Tonopah	90
Daisy	1.05	Nevada Hills	1.10
Fairview Eagle	35	Rawhide Queen	65
Florence	3.90	Sandstorm	21
Gold Bar (Bullfrog)	3	Silver Pick	15
Goldfield Con	5.75	St. Ives	25
Gold Kewenas	30	Tonopah Extension	65
Great Bend	35	Tonopah of Nevada	6.75
Jim Butler	23	Tramp Con	15
Jumbo Extension	33	West End	56

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. October 15.		Closing prices. October 15.
Adventure	7½	Mohawk	63
Ahmeek	115	Nevada Con	16¼
Allouez	37	North Butte	82⅜
Amalgamated	75⅞	Old Dominion	48⅝
Arcadian	3½	Osceola	119
Atlantic	18	Parrot	26¼
Bingham Con	——	Phœnix	——
Boston Con	13⅞	Quincy	91
Butte Coalition	24⅜	Rhode Island	4
Calumet & Arizona	117	Santa Fe	1¾
Calumet & Hecla	660	Shannon	——
Centennial	34¾	Superior & Pittsburg	14
Copper Range	73½	Tamarack	71
Daly-West	9	Trinity	17⅝
Franklin	12¼	United Copper Con	10¾
Granby	99	Utah Copper	40⅝
Greene-Cananea, ctf	10	Victoria	4½
Isle Royale	23½	Winona	5⅛
Mass	5½	Wolverine	137

General Mining News.

ALASKA.

W. J. Bowen, of Seattle, has purchased the mining property belonging to Harry Dobson, of Ketchikan, on Glacier creek, Portland canal. The consideration is $10,000, the first payment of $500 has been made.——The Gold Run Ditch Co. has recently found rich gravel on the left limit of Gold Run, opposite No. 8. It is a well-defined old channel about 2½ ft. thick which pans from $10 to $20.——The latest reports from the strike made by Dolan & McFadden on the Upper Kougarok are to the effect that it is even richer than was first believed. The streak is at least 30 ft. wide.——It is reported that O. C. Mason and Frank Pearl have made an important strike on Glacier creek, in the Candle district.——Howard Ames is at the head of a scheme to put a number of dredges on the tundra between Sunset creek and Penny river.

ARIZONA.

GILA COUNTY.

The Baldwin Syndicate of Chicago, represented by G. T. Harrington, has purchased a group of 15 claims in the Lost Gulch district, near Globe. The purchase includes the E. F. Keller group on which there is a five-stamp mill. The purchase price is not made public. Mr. Harrington has gone to Chicago to organize a company and on his return to Globe will start work and probably re-construct the mill and add new machinery.

GRAHAM COUNTY.

It is said the Copper Queen has had a corps of engineers and assayers at the property of the Ash Peak Mining Co. investigating the property with a view to purchasing. Needless to say all the people of Duncan and vicinity are pleased with the prospect of the Queen entering this field. ——The new machinery, including a big air-compressor and station-pump, has been installed at the Fumarole mine near Safford and is now in operation, and sinking has been resumed in the double-compartment vertical shaft. Several months ago sinking was stopped and all the men put on driving and cross-cutting on the 500-ft. level. The drift on the vein has exposed the orebody a distance of 160 ft. Two cross-cuts have been run 45 ft. each way, without reaching the wall. From the drift a winze has been sunk to a depth of 50 ft., at the bottom of which there is ore assaying about $7 in gold. It is believed that operations on the erection of mills will be commenced within the next two or three months.

MOHAVE COUNTY.

Morgan J. Jones has taken a contract to sink 100 ft. on the Gold Bar mine, at Cerbat, which was recently taken over on bond from T. R. Gariner by J. A. Elway, of Philadelphia.——The shaft on the Pittsburg mine in Crow canyon has reached a depth of 100 ft. and a cross-cut has been started. The new pumping machinery is on the road and some of it has already arrived at Yucca. The plant will have a capacity of 100,000 gal. per day, and when it is installed the shaft will be sunk to the 500-ft. level.—— It is probable that the Pittsburg company which recently took over a group of claims on Big Williams Fork, belonging to Sam Butler, will start work at once. A new hoist has been purchased and the shaft will be sunk from its present depth of 400 ft. to the 1000-ft. level.

YAVAPAI COUNTY.

Development operations on a larger scale than ever before will be started soon on the properties of the Black Mountain Copper Co. in the Mineral Point district. As soon as the new hoisting and air-compressor plant is installed the sinking of a new shaft will be started. Part of the machinery is now on the ground and the remainder of it is on the way to the camp from the factory——Seventy men are now employed in the Monica mine, 13 miles south of Kirkland, the average daily shipments to the smelters being 20 tons. Stoping is being pushed on the 500, 600, 800, and 900-ft. levels, with good showings in every heading. A 50-lb. gold bar was recently shipped through the Bank of Arizona, being the product of a clean-up at the cyanide plant. The property is now being operated by C. E. Bunker, who is receiver under bankruptcy proceedings.

YUMA COUNTY.

The management of the Corona Copper Co. has purchased a hoist for its property, 26 miles northwest of Wenden, and will deepen its working shaft which is now down 400 ft. Three shifts will be worked and an adit, now in 300 ft., will be pushed forward. S. A. Butler, superintendent, of the Company, has recently returned from Pittsburg, where he secured ample funds to carry out the elaborate plans of the concern.

CALIFORNIA.

BUTTE COUNTY.

The owners of the Francisco mine, near Enterprise, have ordered a 50-hp. gasoline hoist and arrangements are being made for the purchase of a 20-stamp mill. An adit 600 ft. long has been driven to the vein, the assays of which are not made public. It is this mine in which Eugene Schmitz, former mayor of San Francisco, is said to be interested. ——It is reported that Ed Morse has found rich gravel in an adit on his placer property on Little Butte creek, between Centerville and Paradise. One $140 nugget was found and the material contains much coarse gold.

INYO COUNTY.

The Inyo Coso Co., a Portland, Oregon, concern, is putting in a 2-in. pipe line 3½ miles long from the Howard springs to its group of claims about 17 miles south of Darwin. A small mill will probably be built in the near future. Considerable development has already been done and good ore is exposed in a number of places in the property.

NEVADA COUNTY.

(Special Correspondence).—A shoot of rich ore has been cut in the west drift from the bottom level of the Golden Gate mine. It is intended to install a 10-stamp mill and an electric power plant at an early date. Charles Hobb, of San Francisco, is manager. W. P. Martin is superintendent.——The water famine is causing considerable trouble in the Grass Valley and Nevada City mines and all of the properties are laying off their employees. The Empire is working a small force, and the Pennsylvania and North Star group are operating with the aid of steam, but it is likely that the latter properties will be forced to greatly reduce operations in the near future.——Machinery for the mill at the Birchville mine is arriving and will be immediately installed. Active underground work is progressing.——The Muller & Walling claim in Woods' ravine has been bonded to J. F. Lane, of Goldfield. An incline shaft will be sunk on the vein and considerable development work commenced.

Grass Valley, October 12.

SAN BERNARDINO COUNTY.

Work has been started on the Flyer property and shipments will be started to the Little Giant mill at Hart. A bunk-house is being erected and the existing 30-ft. shaft is being sent down. Milton Munday is owner.——The foundations of the Little Giant mill are being re-built and the plant overhauled. A rock crusher has been ordered and it is planned to operate the mill continuously hereafter. William L. Foster is superintendent.

TUOLUMNE COUNTY.

Work is to start soon at the Sweeney mine, which has been the subject of litigation at irregular intervals for over a quarter of a century. The shaft will be cleaned out and re-timbered and a new hoist put in. The property is owned by C. H. Segerstrom and George U. Hind, the latter of San Francisco.——Calvin F. Summers has bonded his mine, the Contention, in Jupiter district, to A. C. Morrison. The contract price is $30,000.——Work was stopped at Excelsior mine last week pending the installation of a

pump to handle a large inflow of water recently encountered.——Operations have been resumed at the New Albany; water is being secured for the mill.——A portion of the Santa Ysabel has been leased to C. K. Kelly. He is preparing to begin work.——T. G. Winwood, of Oakland, has purchased the Seminole mine near Arastraville. The consideration is $35,000, of which one-half must be paid before August 5, 1909, and the remainder before January 5, 1910. The terms of the contract require the active operation of the mine, beginning at once.——The management of the Nonpariel, at Big Oak Flat, has decided to cancel all leases and develop the mine on company account.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The bond of $20,000 on the Smuggler property, on Brown Mtn., was lifted this week by the Main Gulch M. & M. Co. Operations are being carried on through the shaft, which has been sunk to a depth of 300 ft. Levels have been run from each 75-ft. station and ore streaks exposed that vary from one to two feet wide. It is the intention of the manager to start sinking at once, as the ore-shoots are known to extend to great depths. A number of lessees are at work, and all are stoping or driving on fine bodies of ore, the average content of the product being in excess of $100 per ton silver and lead. Conti & Co. are sending out regular weekly shipments, while Stevens & Co. are breaking about five tons per day. As soon as the sinking of the shaft has been completed, drifts will be run, at which time new leases will be granted.——Shipments from the Terrible mine, on Brown Mtn., continue and the output during the present year promises to exceed that of any period in a long time. The ground is being operated principally by lessees, operations being centred on both the 11th and 14th levels. It is reported that in the near future development will be started on company account. The 11th, 12th, 13th, and 14th levels are to be cleaned out and re-timbered, while the drifts will be extended to Dunderberg ground, which is an extension of the Terrible vein. B. C. Catren, of Georgetown, is manager.——E. K. Cass and John O'Dea have taken a bond and lease on the Star group of four patented claims in the Peru district. The bond calls for $10,00 and runs for two years, the first payment of $1000 to be made April 1, 1909. Work has been put under way and shipments are promised for the near future. In the breast of the adit there is exposed a 12-in. streak of silver-lead ore that is worth more than $60 per ton. Cass & O'Dea also control a group of 21 claims in the same vicinity and both holdings are to be consolidated. A company is to be organized at once.——The Ruby Argentine M. & M. Co. has advanced the Calla adit past the 1000-ft. point, five veins having been intersected. It is expected that the Calla vein will be reached within from 50 to 75 ft.——Work is to be resumed in a few days upon the holdings of the Atlantic M. & M. Co., operating a large group of claims in the Atlantic district. A. A. Ireland is manager.——Work was resumed this week upon the holdings of the Charter-Raton M. & M. Co., after a close-down of four weeks. Driving has been started on the Charter vein, cut 1000 ft. from the portal of the LaMoe adit, a streak of medium-grade ore being followed that is from 6 to 8 in. wide. J. J. Bonner is manager.——A heavy tonnage of ore is being mined from the Sun and Moon, operations being centred on the 12th and 17th levels. The 16th level has just been started and soon work will be started on the 15th. R. C. Bonney, of Idaho Springs, is manager.——J. Humphrey has taken a bond and lease on the Amazon and Croesus claims, on Seaton Mtn. Work is to be started at once. These veins are on the line of the Idaho adit and will be intersected within the next few months.——A plant of machinery, consisting of a gasoline engine, air compressor, and motor, is being installed at the Merry Monarch adit, in the Alice district. The bore has been advanced for nearly 600 ft., two veins having been passed. J. W. West, of Alice, is manager.——Work was resumed this week in the driving of the Burns-Moore adit, on Chicago creek. Work will be carried on as long as the supply of water is available.——The Humboldt mine, on Ute creek, is undergoing development by Dominick Polaris. An ore-shoot 75 ft. long was recently passed, and free gold is in evidence. Stoping is to be started and a steady tonnage of high-grade ore will be marketed.

Georgetown, October 10.

LAKE COUNTY.

The work of repairing the plant at the Ruby property at the head of Iowa gulch has been going on for some time and development work will be carried on all winter.——Howard Collins, manager of the Anona property, has arranged to also operate the old Gypsy mine, adjoining the Anona in Iowa gulch. The Anona has maintained steady operations since early last spring, and the work there has met with more than favorable progress. The Gypsy is to be operated by Eastern capitalists, but Mr. Collins will manage it in connection with his other work. It is expected that the ore streak that has been found in the Anona will also be opened in the Gypsy. Both the Anona and Gypsy will be operated by electricity, the Anona having been supplied with power since it was opened last April.——Dennis Nealon reports a strike of $75 ore in the adit on his Emerald group in Delmonico gulch.

OURAY COUNTY.

Brown & Barker have found four feet of high-grade copper-silver ore on the Keno claim in Grey Copper gulch near Ouray. The claim is owned by Pierson & Bradley. It is claimed that the ore contains 40% copper and 60 oz. silver.——Work has been stopped on the Mineral Farm property in accordance with instructions from the owner, Robert H. Lucas. It is reported that a party of New York capitalists are trying to buy the Mineral Farm.——George S. Redd has purchased, for the Mine & Smelter Supply Co., of Denver, the Barstow mine in the Red Mountain district. The property consists of 26 claims and a mill-site, and is equipped with a 20-stamp mill, electric hoist, a compressor plant, tramway, ore-bins, and numerous accessories. It is believed that the new owners will open the property next spring.——As a result of drilling in a missed hole at the Treasury adit, one Italian was killed and two others seriously hurt last week. The fault was with the preceding shift in reporting that all holes had been fired.

SAN JUAN COUNTY.

The affairs of the Gold Prince Co. have been settled by the appointment of a receiver and work will be started again.——A second shift was put on last week at the Gold King mine. The new power plant is practically completed, and a larger force will soon be working than before the disaster last June.——The Ross Mining Co. last week started active operation on the Champion property, on Sultan Mtn., starting with 25 men. The ore will at first be shipped to some outside smelter.——Two shifts are working on the Iowa-Tiger, giving employment to 45 men at the mine and 15 at the mill. The Company is shipping one car per day to the Salida smelter, and this record will be kept up indefinitely. The Iowa Tiger expects to work all winter and preparations to this end are going on.

IDAHO.

BOISE COUNTY.

Increased activity is reported throughout the Boise basin. The Golden Rod mine, four miles northeast of Placerville, is treating 40 tons per day in its own mill and has a large ore reserve opened up. The ore now being treated assays about $7 per ton. The process is amalgamation followed by cyanidation. A new 300-ft. double-compartment shaft has been started and extensive development will be done at the 300-ft. level. F. A. Meidinger, of Chicago, is president of the company owning the mine.

IDAHO COUNTY.

Two veins of free-milling gold ore have been struck at the Hope property in the Elk City district. One measures five feet and assays $41; the other is two feet, assaying

more than $50. The property is under bond to Philadelphia and Atlantic City capitalists, who own the South Fork mines in the same district. Hunter Supplee, who has charge of development work, is moving the Espey mill from the South Fork property to the Hope.——Work has been stopped at the Elk mine on the south fork of Clearwater river and will not be started again until spring. Carter Bros., the owners, have sunk a 100-ft. shaft and driven a 55-ft. cross-cut to the ore.——Three feet of carbonate ore assaying 11% copper and carrying $3.60 gold and 7 oz. silver per ton, has been cut at a depth of 60 ft. in the Chicago claim in the Rapid River district. The strike was made at the end of a 90-ft. cross-cut. Salt Lake people own the property.——Work will soon be resumed on the new trail on the south fork of the Clearwater river, to connect Orogrande and Harpster, and it is the intention to have the new route completed this fall.——Charles J. Shadduck, of Spokane, has taken a bond on the Carpenter & Wilson group of claims on Four Mile creek, in the Orogrande district. The consideration is said to be $80,000.

OWYHEE COUNTY.

W. H. Waldron, of Boise, has made the first payment on the Stuben and Ontario property to Sullivan & Matheson, and the company which he represents will start a force of 15 or 20 men at once. This is the same company that is driving the adit to cut under the Weston, Village Blacksmith, Ruth, and Owyhee claims on War Eagle Mtn.—— The tube mill and Wilfleys for the Potosí have arrived and the plant will be ready to run before long. A body of good ore has recently been cut in the south drift on the 300-ft. level, and prospects for the property are bright.—— The mining men and merchants of Silver City have formed a Commercial Club to advertise the camp and promote the interests of the community.

SHOSHONE COUNTY.

(Special Correspondence).—Many interesting developments have marked the last week's progress of the mining industry in the Coeur d'Alene, among which perhaps the most significant is the firing of the first gun of the legal battle between the Federal Mining & Smelting Co., the Coeur d'Alene branch of the American Smelting & Refining Co., and the Bunker Hill & Sullivan Co., the world's greatest silver-lead producer. For a long time past rumors of this great suit have been current in this district, but it was only the other day that matters finally came to a head by the filing of two suits in the Federal Court by the Federal company, with the object of quieting title to orebodies within the plane of the end-lines of the Overlap and San Carlos lode claims. According to the statement of the attorneys representing the Federal company, an accounting will be demanded for the ore already taken from the disputed ground, but no restraining order will be asked for. The plaintiff company claims to have the apex of the orebodies. It is impossible to obtain any estimate of the value of the ore in dispute, but it is certain that the suit will be the biggest of any kind ever tried in the State of Idaho and will rank high among the biggest mining suits of the world. The Federal Court will next meet at Moscow November 16.——The Bunker Hill & Sullivan has declared its regular monthly dividend of $75,000. This is the 133rd dividend paid by the Company and makes a grand total distributed by the mine under its present management of $10,515,000, of which $705,000 has been paid this year.——The whole Coeur d'Alene district has been stimulated by the announcement by the Snowstorm Mining Co. to the effect that the Company will disburse a dividend at the rate of three cents per share October 20 to all stockholders of record on October 10. No announcement has been made as to whether or not future dividends will be paid monthly or quarterly.——The affairs of the Rex Mining Co., which have been considerably tied up by litigation for some time past, look as if they might gradually straighten themselves out. This has been aided by a recent stipulation of the attorneys engaged in the different suits to the effect that the mine may ship during the litigation.——With the construction of the Idaho Northern railroad gradually drawing to a close, the mining industry of the North Side district has assumed an activity almost unparalleled in the history of the county and the indications are that several new dividend payers and many new shippers will be added to the district. At the Bear Top mine, in that district, there is $360,000 worth of galena and more than $200,000 worth of milling ore which will be shipped at the rate of about 350 tons per month. The ore averages $85 per ton. The mill has a capacity of 100 tons per day and is operated by water power. The output will be hauled from the mill to the railroad by four-horse teams, a distance of about three miles.——Work has commenced on the property of the Monarch Mining Co., whose property was recently leased to the Coeur d'Alene North Fork Mining & Smelting Co. At present the men are engaged in cleaning out the upper workings which have been closed since June 1907, and when completed the work of

The Coeur d'Alene, Idaho.

driving a 760-ft. upraise from the lower adit will be started. Everything at the 50-ton mill is in readiness for a full resumption. The recent strike of concentrating ore in the property of the Granite & Allie mine, in the North Side district, together with the advent of the Idaho Northern railroad has practically decided the management to erect a 100-ton concentrator either at the end of this year or at the beginning of next. The ore in the mine averages about $76 per ton in lead, silver, copper, and gold.——A big deal for the purchase of the Sherlock placer claims, at the head of the St. Joe, is said to be pending at present between some New York capitalists and Peter Sherlock, the owner. Mr. Sherlock has been working on these claims, which embrace about 240 acres of land, for more than 18 years, and everything is now ready for development. A 1700-ft. flume has just been completed and the ground has an average depth of about 24 ft.——The annual meeting of the stockholders of the Silver Cliff Copper & Gold Mining Co. was held in Wallace this week and officers and directors for the ensuing year were elected. The Company has decided to continue development work all winter. A report of the year's work was submitted and passed as highly satisfactory. The mine is equipped with every form of machinery and a new wagon-road has been constructed to connect with the railroad. It was from this property that

highest-grade ore ever shipped from the Coeur d'Alene was taken some time ago.——A power line from Thompson Falls, in Montana, to the mines of the Murray district of the Coeur d'Alene has been successfully financed by Ed Donlan, of Missoula. The cost of this plant will be between $2,500,000 and $3,000,000, and it is believed that by this means power can be supplied to all the mines of the Coeur d'Alene at a nominal figure. The power line itself will be approximately 31 miles long, and from the Summit district a branch will be run to the Wallace district. At the driest seasons of the year it is believed that not less than 29,000 hp. can be obtained. The right of way for the line and its branches has already been secured.

Wallace, October 10.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The Lucky Jim Mining Co. has completed its new mill and has started operations. The plant will handle 300 tons per day and is the third large plant to be built in the vicinity within the past 18 months. The others are the Bull Frog and Nortonia. The ground at the Lucky Jim has been well developed and the plant can be kept steadily running. The ore deposit is the same as is worked by the Bull Frog, a high-grade zinc-blende.——The Tidioute Co., operating in Turkey creek bottom, will build a large concentrating plant soon. The Company has a 35-acre lease which has been worked previously, although the mineral supply is far from exhausted. The shaft is now down to 40 ft. and weekly turnins are being made. The orebody continues to 75 ft. as shown in adjoining properties. The old Keystone mine in one corner of this lease has been sub-leased and the ground is being drained preparatory to re-opening.——A number of companies are preparing to re-open their properties or to start development on prospected tracts. The Meadville Mining Co., which last year built a large concentrating plant at Porto Rico, will resume operations. The present shaft is being doubled in size, as it was inadequate to furnish the mill with ore. Galena is the chief ore mined and this occurs in a sheet formation at 180 ft.——Work will be resumed at the Emperor mine, on the Gregg land south of Joplin. A 150-ton mill is on the lease and a shaft is down 145 ft. in good galena and zinc-blende. The property has been closed several months, but no serious difficulty is anticipated with water as only a small amount has accumulated in the drifts.——W. J. Briggle will open a 20-acre lease on the Luke & Ash ground, west of Joplin. The tract has 11 drill-holes and a shaft in a good sheet of ore. A new shaft has been started on a drill-hole which was unusually rich, the cuttings assaying nearly 15% concentrate. A soft ground deposit was also penetrated just above the sheet ore.——The incline shaft at the Temagami mine, west of Joplin, has been completed. The mouth of the shaft is near the mill, while the bottom penetrates virgin territory. The shaft is 6 by 8 ft. and slants at an angle of 45°. It is 242 ft. long, though the ground is worked at the 185-ft. level. Two-ton skips are installed for hoisting. The former vertical shaft near the mill will be used for ventilation after being connected by drifts with the new incline shaft.——Throughout the district a tendency is noticed toward developing the lower levels which were formerly unknown, the shallow deposits only having been discovered. Drilling the past year has been very successful in opening up these lower runs, which are in many cases much richer than the shallow levels. The Goode Mining Co. at Webb City, which has been operating steadily for some time and which is distinguished as being one of the few properties in the sheet-ground district to keep at work without interruption during the panic, will go to work developing the lower runs of ore. The Company has been taking the ore from the 165-ft. level, but the shafts will be lowered to penetrate the deeper runs. ——The rich deep deposits at Oronogo on the Hill Top lease will be developed by J. H. Tonkin and associates. The tract has been thoroughly drilled this past summer and the existence of a rich deposit of sheet ore lying at 230 ft. demonstrated. The deposit is the same as found in the Oronogo Circle No. 5. Some shafts are already down a considerable distance, though none are in the orebody. The pumps are being operated through these shafts.——The Diamond Jack Mining Co. has sub-leased its mine to John Kinmouth and associates, who are taking up the development work. This is an old property and from the shaft over $200,000 worth of ore has been removed. The new Company has sunk a drill hole near the former shaft and penetrated a 30-ft. face of rich galena and zinc-blende. It is probable that much ore still remains and the Company will develop the tract at once.

Joplin, October 10.

NEVADA.

DOUGLAS COUNTY.

The work of erecting the stamp-mill on the property of the Pine Nut Con. Co.'s claim near Gardnerville has been progressing rapidly, and now the stamps are in readiness for the initial run. The boiler, engine, and other machinery have been set in place and the mill-building is now under way. The pump which will lift the water from the shaft will probably be installed next week.

HUMBOLDT COUNTY.

It is reported that a rich strike has been made on the Wihuja lease on the Therien property in Seven Troughs canyon. An 18-in. streak of ore has been opened between the 200 and 265-ft. levels, the assays of which will compare favorably with the richest ore in the district.——The Signal Peak Mining Co., whose property occupies the high divide overlooking Seven Troughs canyon, will make its first shipment of ore the latter part of this month.——The old Essex mine, about two miles west of Chafey, which was worked during the sixties and seventies for silver and which has been idle for many years, has been re-located by A. J. Jefts, F. E. Sullivan, and Mr. Davis, and they, together with E. S. Chafey, have incorporated the group, which contains three claims, into the Chafey Gold Mining Co. Only two miners are at work, but the new Company plans to begin active development soon. The ore remaining in the old working carries mostly gold.

ESMERALDA COUNTY.

The Grutt Hill Truitt Co., of Rawhide, has cut the Coalition & Mint vein, at a depth of 50 ft., which at one point is 18 in. wide and averages $217. At the face of the drift four feet of ore averages $67.——The Southern Pacific is preparing to resume traffic over the old narrow-gauge railroad between Mina and Candelaria which has been abandoned for a period of five years. The road was constructed during the boom days of Candelaria, but when that camp became quiet and its mines apparently worked out, the road was abandoned. Several properties at Candelaria and in the vicinity have now opened and the companies promise sufficient tonnage to operate trains, so the railroad company will accordingly renew the service on the line. It is planned to have the line running about the last of October. ——A second shift has been put to work in the Gotwaldt Combination lease and the big vein on the 315-ft. level is being developed. Stock in this Company was listed several days ago.——It is probable that the shaft in the Mushett lease will be sent to greater depths. A winze for determining the expediency of this plan is now being dropped from the 480-ft. level. The entire bottom of the winze is in pay ore.——The mines of Goldfield produced during the week ending October 10 a total of 1958 tons, estimated to be worth $154,425. During the same period the Tonopah mines produced a total of 5626 tons, of an estimated value of $143,800.

LINCOLN COUNTY.

A larger Cornish pump has recently been put in the shaft of the Quartette and the management plans to sink below the 10th level. Thirty stamps of the mill are dropping, the 150-ton cyanide plant is running to its full capacity and 100 men are on the pay-roll of the Company. ——T. H. Tracy, of Los Angeles, recently passed through

Searchlight on his way from the camp of Capitol. The conditions are said to be exceedingly favorable and a 10-stamp mill is to be put up at once. The Company is building a 10-ton launch on the Colorado and the machinery will be towed up on a barge.

NYE COUNTY.

A sufficient supply of water has been secured by the Keane Wonder to run the mill full time, which will very materially increase the production of the mine. Hitherto the Company has always had to contend with a water shortage, rendering it impossible to run the 20-stamp mill full capacity.——With plenty of ore blocked out in the mine to keep its 100-stamp mill running to full capacity, the Tonopah Mining Co. is devoting a great deal of energy to the opening up of new veins and the prospecting for others. The new work is being carried on throughout the Mizpah, Silver Top, and Red Plume claims of the Company, and drifts and cross-cuts are being sent out on every level from the 200 to the 600-ft. During the past week a total of 348½ ft. of new ground was broken.——The Manhattan Home Leasing Co. has been organized by residents of Manhattan to engage in mining. The Company will be incorporated for $100,000 in shares of $1 each, $15,000 of which will be offered for public subscription, and payments will be accepted in monthly installments of 10%. It is proposed to sink the 200-ft. shaft now on the Briggs-Evans lease, at least 300 ft. deeper, and to also ship the ore that is already blocked out in the upper levels.

WASHINGTON.

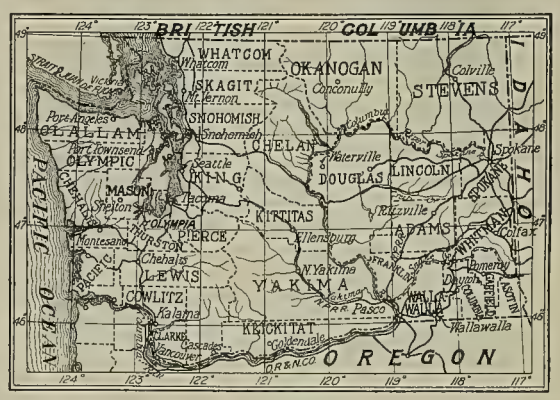
FERRY COUNTY.

(Special Correspondence).—The Keller & Indiana smelter will blow in about November 1 with a reserve of 1500 tons of ore in its bins. Teams are now piling up the reserve, as the Manila mine and other small properties that will supply it cannot furnish the full amount daily. The plant will treat 100 tons per day. This is the first time any attempt has ever been made to put the plant in shape, and the first time actual returns have ever been probable. Keller is 25 miles from a railway, but a steamer up the Columbia, which will make three trips a week, will now handle the matte produced.——The lessees of the Republic mine have renewed their option to J. L. Harper, who has gone East with S. H. Manly to get capital for purchase and development.——A strike of splendid looking high-grade silver-lead ore has been made in the adit on the Summit claim of the Colville Mining & Smelting Co., at Park City camp. Specimens of the ore were shown me by Capt. Hanford, of Seattle, who has been inspecting the Mountain View and other mines in that camp. He says the vein is eight inches wide and is considered to be a stringer, the main vein not yet having been cut. Ten men are engaged on the erection of the Company's smelter.

Republic, October 10.

STEVENS COUNTY.

(Special Correspondence).—The First Thought Gold Mines, Ltd., is preparing for extensive operations, and has ordered a six-drill air-compressor plant, a 60-hp. gasoline engine, and a diamond-drill outfit. It is intended eventually to use electric power, and the compressor plant will be arranged with that end in view. The working force is being largely increased, expecting to double the present output. The Company owns nine patented claims and intends exploiting its virgin ground thoroughly in various places. Both the Northport and Trail smelters are now receiving First Thought ore.——In the North Star mine, the south extension of the First Thought, a large body of free milling gold ore has been developed at a depth of 150 ft. The ore assays from $9 to $20 per ton across 80 ft. of the vein. A trial shipment of a carload of ore will be made soon.——Ore assaying as high as $43,000 is reported to have been struck in the upper workings of the Beecher mine, in constantly widening stringers. The Company is sorting the ore and expects to make the first carload shipment in a few days.——Eastern capital has been secured for the McKinley group of claims in Pierre Lake district, and development work has been resumed.——It is reported that the old Acme mine, five miles south of Kettle Falls, has been bonded to the British Columbia Copper Co., of Boundary Falls, B. C. Several years ago the Northwest Mining Co. had an adit 1300 ft., but without expected results. The surface indications were the inducement for the new deal. The consideration is reported to be $50,000.——In Chewelah district pipe is being put in the Jay Gould mine, for a steam-driven Burleigh drill to be used on the 175-ft. level. A winze has been sunk 30 ft. from the 100-ft. level and is in a fine quality of ore. A blind lead was struck on the 150-ft. level which proved to be about 25 ft. wide, the ore assaying about $9 per ton.——Work has been started on the Three Sisters mine, a new copper property near Chewelah. The vein outcrops for a distance of about 400 ft., and is 20 ft. wide.——The first annual meeting of the Silver-Lead Mining Co. was recently held at Newport. The officers elected were W. E. Weltzin, of Cement, president; J. H. Long, secretary, and D. Caldwell, treasurer. The Company has done considerable work and developed a five-foot vein of lead oxide ore, which assays 35% lead. The Company has funds on hand for further developing its property.——The Bornite Mining Co. has about 160 acres of ground near the Pend d'Orielle river, 3½ miles northeast of Newport. A large quantity of gold and copper ore has been blocked out. The No. 1 adit, driven 250 ft. on the vein is all in ore. The main adit, 575 ft. long, has been re-timbered and a cross-cut 100 ft. from the face has cut through fine looking ore. After a few months further development the Company will begin shipping ore.



Map of Washington.

Orient, October 9.

CHELAN COUNTY.

(Special Correspondence).—The Washington Meteor Mining Co. has a well-developed property at Blewett, 16 miles south of Leavenworth, in the Mt. Steward district. This district is drained by Pechastin creek, that flows into the Wenatchee river. The Company has locations that cover more than a mile of the strike of a fissure vein which cuts through a serpentine country. Former owners did several miles of work in the shape of adits and drifts, and this Company, under the superintendency of E. C. Limbach, drove a working level 100 ft. lower than any of the old workings and made a raise connecting them. The length of the new adit level is 1500 ft. A shoot of ore has been opened on the lowest level and the one above it, the raise between them being in ore. It is stated that the orebody thus opened ranges in width from 2 to 18 ft. The ore consists of quartz carrying free gold and iron sulphide that runs high in gold. An aerial tramway, 800 ft. in length, was erected by former owners to carry the ore from the mine to the mill. The latter is equipped with 20 stamps, plates, vanners, and cyaniding facilities, the machinery being run by water power. The intention is to start the mill later.

Leavenworth, October 10.

Special Correspondence.

LONDON.

Depression in Cornwall. — New Smelter at Liverpool. — Changing Conditions at Swansea. — Plans for the San Francisco del Oro Mine. — Fitzroy Gold & Copper, Queensland. — Dredging in Tierra del Fuego.—Report of El Oro, Limited.

Cornwall is just now experiencing disappointment. The greater demand and higher price for tin of late years, together with the supposed improvement in methods of mine-drainage and ore-dressing, were regarded as the commencement of a new era of prosperity for the Duchy; but things have fallen so lamentably short of anticipation as regards the vaunted superiority of methods that business is far from being cheerful, even though black tin still stands at the respectable level of £80 per ton. This may well be regarded as a matter for surprise, seeing that a good deal of capital has so recently been spent in development, and that some of these mines lived through the stress of a time when tin was at less than half the present ruling price. The Dolcoath shareholders have had to forego their usual dividend for the last six months, and a set-back is felt in tin mining generally in the county. One hears little of the new schemes which originated some four or five years ago. Some have been abandoned or suspended, and others are not yet in working order, mainly, it is said, through failure to get results from the electric plant. There seem to have been sad errors of judgment somewhere on the part of the promoters, seeing that electric pumping has so long been successfully practiced elsewhere. This matter—this fiasco, it may be said—was much to the fore last month during the meeting of the Polytechnic Society of Cornwall at Camborne, but the discussion seems to have left things much as it found them. It now remains to be seen whether, in dealing with heavily valued mines, the electrical pump will not be discarded in favor of the old arrangement with the direct-acting steam engine, which, though more cumbrous, seems after all to be cheaper. Electricity, in spite of the recent difficulties, will eventually be applied in Cornish mining, the power being generated in the nearest coalfields. Great things were promised, too, in certain quarters by more modern methods of concentration, particularly of tin slime, and in dealing with the 'baloans,' and the dumps of the old mines. There has been liberal outlay and no end of experiment, but nothing brilliant in the way of result. The Red river presents a problem that seems as far from solution as ever.

A few weeks ago I mentioned that the old firm of Williams, Harvey & Co., the tin smelters, of Hayle, Cornwall, were contemplating an extension of their business by erecting a new smelter for foreign ores at Liverpool. As it is commonly supposed that the metallurgy of the non-ferrous metals is a stagnant if not decadent industry in Great Britain, this news was of exceptional interest. Since writing the paragraph in question, it has occurred to me that I ought to mention the fact that one of the old Swansea firms has recenly been re-organized and extended on modern and up-to-date lines. This includes the business of Williams, Foster & Co., and Pascoe Grenfell & Sons, Ltd., of the Morfa, Middle Bank, and Upper Bank Works, Landore. This is an unwieldy name, it is true, but old names and trade marks count for a lot in English metallurgical industries, and it would be doubtful policy to eliminate the old names. Williams, Foster & Co., of Morfa, have been copper smelters for generations, and Pascoe, Grenfell & Sons have been zinc and copper smelters at Middle Bank and Upper Bank for quite as long a time. The two firms were amalgamated in 1892 when Henry R. Merton & Co., of London, and the Metallurgische Gesellschaft, acquired the controlling interest from the trustees of the old owners. During the last two years large sums have been spent in re-modeling the plant. The new zinc distilling house at Upper Bank, and the new copper-rolling mills at Morfa have been admirably designed on modern principles. The zinc smelting industry at Swansea is flourishing, and ores are easily obtained from all parts. In fact, the smelters are somewhat independent in their manner of dealing with ore producers, and some of the English zinc mines can get better prices for their ores from Belgian and German smelters than they can in Swansea. As regards the smelting of copper ores at Swansea, this is without doubt a decaying branch of trade. It is difficult to get supplies of ores on a large scale. Matte and Bessemer bars are more readily obtainable, but even then the customs smelters, such as Vivians and Williams, Foster & Co., cannot meet the demand of their rolling mills by the output of their refineries, and have to buy refined bars to make up the shortage. The firm of Williams, Foster & Co. and Pascoe Grenfell & Sons, Ltd., has spent something like £100,000 during the last year or two in making these improvements in the works.

I should like to give a pen picture of the Landore, Llansamlet, and Morriston valleys, behind Swansea. In spite of the Alkali Works Act, which prohibits the discharge of acid fume into the atmosphere, the districts on the two sides of the Tawe river are just 'the last places in the world.' Smelting works, acid works, fertilizer factories, tin-plate works, and a host of others, vie with one another in rendering the atmosphere unbreatheable. On a moist day when the mists hang over the valley the conditions are the worst. When you cross the Tawe on the ferry punt, which is fastened to a chain for protection against the force of the tidal current, you are reminded of Charon's journey over the Styx. The ferry takes you from the Morfa to the Upper Bank works. Vivian's acid plant is perched on a slag pile to one side, and behind rises the Kilvey hill, quite devoid of vegetation. As a contrast to this scene of desolation, the country to the west and south of Swansea is beautiful in the extreme, and the workers in Landore who, on leaving the scenes of their labors, proceed to their domestic circles at Sketty, Mumbles, and Langland Bay, are well compensated for the dreariness of their surroundings during the day.

A few months ago I referred in this column to the difficulties met by the San Francisco del Oro Mines, Ltd., which works the mines of that name near Parral, Chihuahua. The directors have been experimenting on a system of dry concentration, but have now given it up, and are turning their attention to improving their water-supply with a view of adopting wet concentration. The ore contains zinc and lead sulphides, and should be tackled on the established lines for this class of ore. Hitherto the directors have been content to make ends meet by picking out the best quality of ore that could be sold direct to the smelters. In order to put up a new plant additional funds will be required. These are to be raised by re-constructing the Company on the basis of an assessment of 5s. on 330,000 shares of £1 each. If everybody pays up, £82,500 will be raised in this way, but I very much doubt whether all the shareholders will be found ready to provide their quota.

One of the more recent ventures of the Australian group, identified in England with Bewick, Moreing & Co., is the Great Fitzroy gold and copper property at Mount Chalmers, near Rockhampton, Queensland. The Company was formed in Melbourne more than a year ago, £325,000 in shares being paid for the property, and £50,000 being provided as working capital. The ore was estimated to contain 3 to 5% copper, and from 4 to 8 dwt. of gold per ton. A smelting plant on a semi-experimental scale was erected, and operations were conducted for some time with the object of ascertaining the right method of treatment, and during this time development was actively continued. The smelting plant and the mine are now reported to be in excellent condition, and the directors are going ahead with the extension of the smelting plant. During August 3303 tons of ore were smelted direct, producing 353 tons of

matte, which contained 101 tons of copper and 618 oz. of gold. When the new plant is completed, the capacity will be increased to 9000 tons per month. It is reported that the payable ore on June 30 amounted to 334,000 tons above the 225-ft. level. The main orebody at this level is about 100 ft. wide, and is proved for a length of 300 ft. Development work has been commenced at the 300-ft. level. In addition there is a southern extension of the lode, high in copper and gold, and of considerable extent. It is, however, silicious, and the ore will have to be concentrated. The Government is building a branch line of railway to the mine, by which means the cost of treatment will be substantially reduced. The Company has sufficient funds in hand to pay for the extension of the smelter, so that no new issue of shares is to be made.

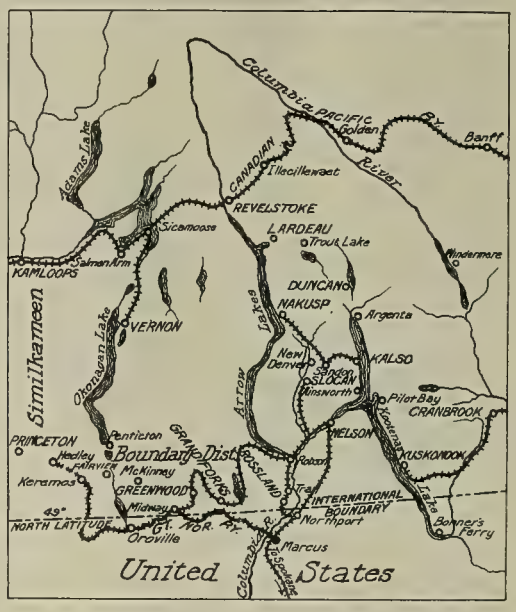
A dredging proposition that has been recently put before the public in London is the Queen Gold Dredging Co., which has acquired gold gravels in Tierra del Fuego from local owners. I believe this is the first dredging property in that district that has been introduced to English capital, though many dredges are in operation, worked by Argentine or Chilean owners. The engineer who has been instrumental in interesting London promoters in this subject is Percy B. Weston. He has now proceeded to the spot as manager for the Company. The dredge has been designed by Cutten Brothers, and is on its way out. The deposits are covered with a peat overburden, which will be stripped by means of a grab excavator. It will be interesting to follow the fortunes of the Company.

The report of the Mexican mines of El Oro, Ltd., for the year ended June 30 last, is interesting reading. This Company is an off-shoot of the El Oro Co., and was floated by the Exploration Company just four years ago. The property lies to the north of the Esperanza mine, and contains a continuation of the same vein which passes through the Esperanza and the El Oro ground. The Company was floated with a capital of £180,000, of which £71,740 was subscribed in cash. At first considerable profits were made by the sale of high-grade ore to the smelters, and additional funds were thus available for the completion of the milling outfit. About £65,000 has been obtained in this way. The mill was completed last September, and commenced running on October 1. It consists of a 40-stamp mill, tube-mills, and cyanide plant. During the nine months up to June 30, 1908, the amount of ore treated was 62,394 tons, from which bullion to the value of £164,826 was recovered, being an extraction of nearly 13 dwt. per ton. In addition, 2038 tons of high-grade ore were shipped to the smelters, which yielded a net profit of £71,616. The realized profit for the year ended June 30 was £132,897, out of which a dividend of £45,000 has been paid, while £71,000 has been written off for preliminary development and cost of plant and buildings. The mine continues to open up well, and the reserves on June 30 last amounted to over 200,000 tons of ore running 11¾ dwt. gold and 6 to 7 oz. silver per ton.

ROSSLAND, BRITISH COLUMBIA.

Report of Consolidated Mining & Smelting Co.— Concentration Problems at Rossland. — Output of Le Roi Mines. —Boundary Ore-Shipments.

The annual report of the Consolidated Mining & Smelting Co. of Canada, Ltd., operating copper mines at Rossland and Phoenix, the principal lead-silver mine of Canada, at Moyie, and an up-to-date copper-lead smelter and refinery, at Trail, B. C., is at hand. This Company paid in dividends $66,940 during the past fiscal year. The balance on hand, after an expenditure of $500,000 for development and after writing off $132,000 for depreciation of plant and equipment, and $27,000 on stores and doubtful accounts, is $33,500. Had the metal market not weakened, the profits of the Trail smelter would have been over $400,000 more than they were, upon the ore on hand at that time. The output of the smelter was increased 43% during the year, being valued at $5,425,501, against $3,786,146 for the previous year. The report shows that the value of the ore extracted from the War Eagle, Centre Star, Iron Mask, Snowshoe, Richmond-Eureka, and St. Eugene since 1894 is estimated at $31,000,000. There are 19 miles of underground work in the Centre Star-War Eagle group, at Rossland, and 12 miles in the St. Eugene. The Consolidated company is capitalized at $4,698,800, in $100 shares. Local authorities consider that the Consolidated company has made a good showing, when everything is taken into account. The big concentrator erected at Trail for the reduction of Rossland ore, and which was acquired by the Consolidated company in the re-organization, is being dismantled. The old capitalization of the Rossland Power Co. was $600,000, but when its assets were taken over by the Consolidated, the watered stock was drained off, and these assets taken into the new Company at $60,000. It is now a recognized fact that the former management of the Centre Star-War Eagle mines made a mistake in building this concentrator eight miles from the mines. The freight rates, lack of sufficient water, loss in the tailing, and general recalcitrant character of the Rossland ore led to the abandonment of the plan to concentrate Rossland ore at Trail, it being found more economical to send the ore direct to the



British Columbia.

smelter. The valuable machinery that was distributed throughout the huge building has been sold or shipped by the Consolidated to its various properties, where it was needed. The Rossland Power Co. had a heavy item on the debit side of the ledger because of this enterprise, and there is little doubt that the Consolidated company will stand quite a loss, even though it took over the assets of the power company on a close margin.

The concentration of Rossland pyritic ore has so far remained an unsolved problem. There is an abundance of gold ore on the dumps and in the Rossland mines that assays from $3 to $5 in gold. The Le Roi Mining Co. employed an expert on milling and erected an experimental concentrator, only to find that it would not pay. The White Bear Mining Co. erected a costly mill and operated it at a small profit, crushing the ore by means of stamps and catching a major portion of the concentrate on Wilfley tables. The Le Roi No. 2, Ltd., is operating the concentrator and making a profit on the low-grade ore. The ore is first crushed in Blake crushers, whence it goes to the Chilean mills, and then the heads run over two Wilfley tables for coarse concentration and to two others for saving the finer concentrate. The oil-concentrating plant is not in operation, having proved uneconomical. The manager's report on the operation of the Le Roi No. 2, Ltd., for Au-

gust states that 2430 tons of ore was shipped. The net smelter-receipts were $47,139 for 2106 tons of ore, and $950 for 69 tons of concentrate.

The report of A. G. Larson, superintendent of the Le Roi, for the month of August states that 6191 tons of ore was sent to the Northport smelter. This carried 2837 oz. gold, 3350 oz. silver, and 147,000 lb. copper. The sum of $9000 was expended on development during the month. The estimated value of the above output is $77,000, and the profit $15,000. Most of the ore now found in the lower levels assays from $9 to $11, but some richer ore is being opened up, and occasionally ore is found that contains $35 to $40 gold per ton.

Ore shipments from the Boundary mines for the week ending October 3 again show a slight decrease, the total being 34,959 tons, the Granby, Snowshoe, Mother Lode, and Oro Denoro shipping. The ore shipments from the Phoenix mines have now passed the one million ton mark within the calendar year. The Granby contributed 76%, the B. C. Copper 21, and the Dominion Copper Co., Snowshoe, Sally, and Crescent the remainder. The Boundary mines, more particularly the Granby and B. C. Copper, have shipped more heavily this year than heretofore. The Boundary miners have been forced to make heavy shipments by the existing low price of copper and the high cost of production. The disastrous fire at Fernie was the cause of a coke shortage which affected the Granby and Dominion Copper companies to a considerable extent. This, however, did not affect the B. C. Copper Co. directly, as it obtains fuel from a point in the Crows Nest district which was not damaged by the fire. Then came a shortage of cars, which caused the output to drop to the figures given for the week ending October 3. This car shortage was the result of the heavy wheat shipments to the East.

While mining operations are being continued on the Stemwinder and Rawhide mines of the Dominion Copper Co., and a large quantity of ore is broken and ready for shipment, work has not been resumed at the Boundary Falls smelter. It is rumored that the company is once more short of funds, and that the local officers are awaiting advice from the Eastern office before resuming at the smelter. The Dominion Copper Co. is in a fair way at present to make a profit. The Granby and the B. C. Copper Co. have demonstrated in a satisfactory manner that the mining and smelting of the low-grade copper-gold ores of the Boundary can be made to pay a good profit. With an advance in the market price of copper to 15 or 16c. the Dominion Copper Co. could be placed on a sound basis with little capital.

BUTTE, MONTANA.

Amalgamated Extends Holdings at Great Falls. — Electricity for St. Paul R. R. on Rocky Mountain Section.—Davis-Daly Re-organization.—Butte Copper Montana Co.—Butte Extension. — Opening of Panhandle Smelter at Ponderay.—Butte & Arizona Mining Company.

John D. Ryan, managing director of the Amalgamated Copper Co., and presumed to represent H. H. Rogers, the Rockefellers, and associates, has purchased 3500 acres of land between Great Falls and the falls of the Missouri river, where that Company acquired nearly all of the water and power rights some time ago. This purchase gives the Ryan group of capitalists complete ownership of the river-front and of tremendous power resources. They will build two immense dams on the river and will furnish electric power for a large portion of the industries and mines of Montana. Two power lines will be built to Butte, and electric power will be furnished to all the Amalgamated and other mines. Contracts have already been made for furnishing electric power to the Chicago, Milwaukee & St. Paul railroad, which will operate its trains over the Rocky mountain country by electricity as soon as the power can be furnished and the road 'electrified.' Electricity will be used by the St. Paul system over a large part of western Montana and through Idaho. The power company owned by Mr. Ryan and his associates is one of the most important in the West. They are investing several million dollars in it.

The Boston & Corbin Copper Co., operating in the Corbin district, has secured estimates and plans for a new surface plant. It has been decided to install a first motion hoist with a capacity for sinking to a depth of 2000 ft. The lowest workings are now at a depth of about 700 ft., and the veins on which driving is now in progress are good. The Company is making preparations for opening the property on broader plans, and to raise through the ore-bodies from the 1200-ft. level, when that is opened.

Notwithstanding the statement from the re-organizers of the Davis-Daly Copper Co. that fully 90% of the old stockholders had exchanged their stock and paid the first installment of the assessment of $2 per share, it is evident that a very large amount of the stock is delinquent. It is stated that the new Company has interested London capital in the enterprise, the Venture Co. being mentioned in that connection. The Davis-Daly Co. owns about 200 acres of ground in the Butte copper district. The oft-repeated statement that the Company owns 400 acres takes account of several mining claims west of Butte and outside of the copper belt, and also of a ranch of about 200 acres situated south of Butte. The mining claims in the district are so situated that it would seem impossible to miss developing a big copper mine, but so far no ore has been found. Sinking is still going on in the Colorado shaft, where the only work of the Company is being carried on. The shaft is down nearly 1400 ft. It is being sunk at the rate of about 100 ft. per month. The Colorado has opened several veins carrying bunches of ore, but not of a commercial character. The ore is heavy in zinc, and until a process is discovered for the successful treatment and separation of the copper from the zinc, the Colorado will have a great quantity of useless ore. The same character of ore predominates in many mines, in the Butte district, which have never been able to pay. These include the old Emma, the Lexington of the La France Co., the Blackrock of the Butte & Superior Co., and the Alice of the Butte Coalition Co. A former official of the Davis-Daly Co. says it will require $400,000 more to thoroughly develop and equip the Colorado mine. The re-organization and re-financing of the Company is intended to put $1,200,000 in the treasury, and half of that will be paid out at once in taking up options and paying attachments and pressing debts, leaving $600,000 with which to carry on development. If $400,000 will be required on the Colorado alone, it would appear that the plans of the re-organizers do not take a very distant future into consideration, or they are based on the hope that a big producing mine can be made out of the Colorado.

A number of inquiries have been received in Butte recently relative to the affairs of the Butte Copper Montana Co. and the Butte Copper Co. The two companies were organized on the same property, the former having been organized in New York and made a holding company for the other concern. The latter owns a two-thirds interest in the Robert Emmett No. 1 and Robert Emmett No. 2, and three-eighths in the Anselmo No. 1, Anselmo No. 2 and the Trifle. Private parties own the other interests in the Anselmos and Trifle, and the Butte Coalition Co. owns the one-third in the Emmett. The well-known policy of the Coalition people is to sell no mining property, and to permit no joint owners to operate it, so that the Butte Copper Co.'s ownership in the Emmett is of little value. The Company had options on the outstanding interests of the Anselmo and Trifle, but allowed them to lapse. The promotion and management of the Butte Copper Co. have been subjected to much criticism. The promoters and officers of the Company represented that the Company owned all interests in the Trifle and Anselmo mines, and had an abundance of money to carry on development for several years. On this representation stock was sold in Butte, but as soon as Butte was 'milked dry' the officers of the Company went to New York and organized the Butte Copper Montana Co., the so-called 'holding' company. When news of this action

reached Butte the stock of the Company on the local exchange dropped from $1.15 per share to nothing. A few days ago a lot of stock was offered at 3c. per share and found no buyers. E. H. Sherman, of Butte and Chicago, principal promoter of the two companies, has been forced into bankruptcy. John MacGinniss, former mayor of Butte and a former lieutenant of F. Augustus Heinze, is interested in the Company. It has no indebtedness, and it is likely that with an improvement in financial conditions throughout the country, another effort will be made to finance it.

The Boston & Montana smelter at Great Falls is now receiving all of the ore mined by that Company. During the long shut-down many improvements were made, aiming at greater economies in the handling of ore. Work is progressing on the new smokestack, which will be the highest in the world. When completed it will enable the company to make a saving in the flue-dust at a profit of $180,000 per annum. The cost of the stack will be about $350,000, so that the saving will pay for the expenditure in less than two years. Work on other changes and improvements at the smelter are still going on.

The Panhandle smelter at Ponderay, Idaho, which has been purchased by interests representing the independent mine operators in Montana, Idaho, and Washington, will be 'blown in' October 20. The smelter has been improved and repaired and is now in shape to handle all the ore that will be shipped. A large quantity of ore is already on the ground, and contracts have been made for enough more to keep the smelter running continuously. Its success is so far assured that plans are being made for an enlargement of the smelter. The opening of the anti-trust plant is to be made an event, and excursions are to be run to Ponderay from places in Montana, Idaho, and Washington.

News from the mine of the Butte & Arizona Mining Co. indicates that the adit is approaching the orebodies, as a large quantity of water has been struck. The adit, which is now about 3000 ft. long, is being driven by contract. In August the adit was extended 107 ft. The contractor is Caspar Schultz, of Butte, who was superintendent for the Company last year. The face of the adit is about 900 ft. under the surface outcrop. All the damage done by the fire last spring has been repaired and new buildings erected. The property is situated about 35 miles from Bisbee, near the Mexican boundary, the Cananea mines being in plain view. A number of seams of ore were cut by the adit, and some driving was done in the search for ore. The management of the Company has great faith in the property.

The Montana coal mine operators and the miners have reached an agreement and the general strike of miners in this state has been averted. The old agreement was renewed, and there will be no change in the wage schedule during the next two years.

SALT LAKE, UTAH.

Utah Copper Co's. Output.— Transportation Difficulties. — Effect of Closing Tintic Smelter.—Development West of Oquirrh Range.— Majestic Mines.—Utah Apex Mining Company.

Although the concentrating mills at Garfield were somewhat handicapped for ore, owing to deficient transportation facilities, the Utah Copper Co. made a good output in September, producing approximately 4,500,000 lb. of copper, yielding a net profit of $225,000. The Boston Consolidated undertook to start four more units of its mill, making eight in all, but the management was unable to take care of the anticipated tonnage. President Charles M. MacNeill and other officials of the Utah Copper Co. were in Utah last week. During their stay the important subject of ore transportation in the Bingham district was again discussed. Mr. MacNeill is said to have expressed disgust with the service the Company is receiving from the Gould system of railroads and to favor the building of the extension of the Bingham & Garfield railroad without unnecessary delay. The rights of way have already been secured, and 16 miles more track would make the Utah Copper Co. absolutely independent, as far as concerns the transportation.

The temporary shutting down of the Tintic smelter has had the effect of greatly reducing the output of ore from the Tintic district, and one company has suspended dividend payments until normal conditions prevail. This is the Colorado Mining Co., which has been one of the principal shippers of ore to that plant. It has been the policy of the management of this Company to share profits with stockholders whenever the treasury contained a surplus. Two other Tintic companies, however, have announced dividends for this month, the Uncle Sam Consolidated, $25,000, and the Sioux Consolidated, $30,000, the latter making its initial appearance in the dividend column.

Attention is again being directed toward the development of that region lying west of the Oquirrh range of mountains, directly opposite Bingham. Boston people are interested in the Bingham Metal Mining Co., which has been pushing a vigorous campaign of development for the greater part of the past two years. An adit has been driven 1400 ft., which is expected to eventually tap the ores at a depth of about 1200 ft. vertically from the surface. This Company is said to have expended nearly $75,000 for development purposes. Isaac Meserve, of Boston, is at the head of the enterprise. The Great Divide Mining Co. owns adjacent mining property, and is installing a compressor and power-drills preparatory to increasing activity. No mines of any consequence have been developed as yet on the west slope of the mountains.

J. M. Dick, vice-president of the Majestic Mines Co., inspected the properties of that Corporation in Beaver county last week, and made the statement that development would again be undertaken upon an elaborate scale; and that the financial end of the enterprise had been straightened out. The appointment of A. D. Moffat as manager was also announced. Mr. Moffat was formerly superintendent of the properties of the Newhouse Mines & Smelters corporation.

When President E. R. Hastings and Treasurer J. W. Horne, of the Utah Apex Mining Co., departed for Boston on October 4, they were satisfied that the Bingham mine had at last reached a paying basis. Never before have physical conditions at the Utah Apex been so satisfactory as at the present time, and the officials frankly expressed their appreciation of the results accomplished during the administration of Robert S. Oliver, the present manager. Mr. Oliver recommended a new plan of operation. It met with the hearty approval of the officials, and will mean a saving to the Company of about 75c. per ton in the costs of extraction. The plan involves making connection between the Parvenue adit and the 700-ft. level of the mine by means of a three-compartment raise, giving room for the operation of two cages, besides a manway. The raise will be 350-ft. high. The ore will require no handling after being loaded into the mine cars, which will be dropped to the Parvenue adit, thence conveyed to the new ore-bins shortly to be constructed at a convenient point on the Boston Consolidated branch of the Denver & Rio Grande railroad. The point selected for the raise is approximately 3000 ft. from the portal of the Parvenue adit, while the distance from the latter to the Boston Con. switch is nearly 1500 ft. From the ore-bins the first-class ore is loaded automatically into railroad cars. This ore has a gross value of $30 per ton, on the basis of present metal prices, and nets the Company $25. The second-class ore will have to be concentrated. What the Company proposes to do in the way of providing mill facilities is still undecided. On the fourth level of the mine has been developed what is probably one of the largest bodies of galena ore ever found in the Bingham camp. It has been explored for a length of 530 ft. The width of the high-grade streak averages 4 ft., and the mill-ore from 10 to 15 ft. There are three well-defined bedding-planes in the property, all between lime, which are designated respectively as the Andy, Petro, and Parvenue. Connecting the Parvenue adit with the upper workings will eliminate the aerial tramway, and will introduce large economies at the Utah Apex mine.

MEXICO.

Revision of Railroad Rates.—Oaxaca Iron and Coal Co. — Re-organization of Smelting Companies in Oaxaca. — Navidad Mine Increasing Plant.—Activity in Ejutla District.

As yet the railroad commission has given no decision on the proposed increase in freight rates on imported coal and coke, but at a meeting held by that body on the afternoon of September 29, in Mexico City, the leading representatives of both sides of the controversy were heard at length. The coal producers claimed that they could furnish as good an article as was imported, and meet at least three-fourths of the country's demands, but in order to do so they must have some kind of protection against foreign importations; the railroads claimed that, to meet the costs, the rates must be raised, and that it was reasonable to ask ₱1 more on coke than on coal. The smelter men stated that the rates on the Mexican railroads for coal and coke were already higher than in the United States; that they could not get delivery from domestic producers; that the domestic fuels, though considerably improved in the last two years, were still of an inferior grade, and for a number of reasons they were forced to use a considerable quantity of foreign coal and coke, and any increase in the rates on the same meant increased costs in smelting operations, and a consequent necessity of raising the charges for smelting. The mining men reiterated the statements of the smelter men, dwelling particularly on the possibility of increased smelting charges, and stated that with the metal markets as they are, the burden on the metal mines was already more than they could continue to bear. They begged that, if the rate must be increased in order to protect the home producer, all possible consideration be given to the metal mines in fixing a moderate tariff. Both sides asked for a prompt decision either way, as being preferable to suspense. The Chamber of Mines was most active in the discussion, and it is preparing for strong action on the anti-foreign article in the proposed new mining law.

The Governor's message to the State legislature of Oaxaca at its opening session on September 16 stated that the holders of the concessions for the Oaxaca Smelting & Refining Co. and of the Magdalena Smelting Co., had both asked for extensions in which to re-organize, and that he had hopes that both might resume operations before the end of this year. He further stated that the Oaxaca Iron & Coal Co., of Tlaxiaco, had developed a good marketable coal, and that its work was rapidly showing the value and proving the extent of the Oaxaca coal fields. The Oaxaca Iron & Coal Co. has taken up more than 1100 pertenencias of iron and coal lands, and with the diamond-drill is thoroughly exploring the ground, having proved up several veins of a good quality of coal from 2 to 10 ft. thick. This Company expects to enter the market during the coming year. The Navidad mine, in the Sierra Juarez district of Oaxaca, continues in bonanza, and as a consequence is adding 20 stamps and a tube-mill to its equipment, thus increasing the capacity of the mill from 60 to 150 tons. The treatment has been made considerably more efficient by the addition of the Pachuca cyanide tank. The San José de Gracia, also in the Sierra Juarez district, expects to have its cyanide plant in operation before the end of October. The Providencia-San Carlos Mining Co. has made its last payment on the San Carlos property, and it is believed that operations will be resumed there within the next month. The mill of the Rosario Mining Co., of Oaxaca, is to be moved to Cuatro Amigos, on the Manzanito river, for power purposes, and the capacity of the mill is to be doubled. Joseph Kimball and associates, of Salt Lake City, have been visiting Los Ocotes mine, in the Ejutla district, inspecting with a view to making purchase. R. L. Kayser has taken an option on the Aurora and Margarita mines, near Los Ocotes, for the Teziutlan Copper Co., of Teziutlan, Puebla. This Company, during its shut-down caused by the drop in copper, has made a thorough overhauling of the Teziutlan plant, increasing the capacity to 750 tons per day, and it expects to resume operations by January 1, 1909. It has also asked from the Department of Fomento a concession for 1500 litres of water per second from the Atoyac river, and an additional 1500 from the Sola river to be added to the former for power purposes for the smelter and mines.

Pay Day at El Oro.

In Durango the Peñoles Mining Co. has made another rich strike on the edge of the Mapimí district, considerably extending the productive area of that region, and already 100 tons per day are being shipped from the new vein. At the Company's smelting plant at Mapimí the flue-dust is being more successfully handled than hitherto. An arsenic plant has been introduced which is extracting this material from the poisonous gases. In the Carmen mine of the San Juan Mining Co., of Mapimí, a rich lead strike has also been made, and new machinery is being installed.

In the Descubridora camp, at the end of the Durango Central Railway, from Conejos, which has been practically dead for several years, it is said that the copper bodies are being passed over and that good silver, lead, and gold are being found on the east side, and there is promise of new life in the almost abandoned camp.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Complete change of clothing on entering and leaving mines is compulsory in Western Australia. The 'change-houses' are also required to be kept exceedingly clean, and the regulations also compel observance of strict sanitary measures below ground.

An acid-resisting cement may be made by the following formula: silicate of soda, 6 parts; glycerine, 1; red lead, 3½; fine cinders, 10 parts. Mix the silicate of soda and glycerine first and then add the red lead and cinders. The cement sets soon after mixing, and unites with brick or portland cement to form a strong joint.

Pressure does not necessarily increase the solvent effect of solutions. The general law governing the relations of pressure to solvency is that the change must lead to a reduction of volume. Consequently, if the solid substance and the solvent contract when solution occurs the solubility will be increased with increase of pressure, and vice versa. The silicates generally dissolve more readily with higher pressure.

The Chocó is the name of an 'intendencia' in the western part of Colombia, but the historic use of the name is in connection with the famous placers which paid the 'king's fifth' on a recorded production of over $200,000,000 gold. The placers are also unusually rich in platinum. The early production was from the shallow streams and 'high banks' along the Chocó river. The region is one of the most promising in South America for dredging enterprises.

Carbon dioxide, or carbonic acid gas as it is commonly called, has been used to some extent in fighting mine fires, but its employment is attended with some peril. Carbon dioxide in contact with the burning mine timbers, after the available supply of free oxygen has been consumed, will be reduced to carbon monoxide ($CO_2 + C = 2CO$), which is liable to produce disastrous explosions as soon as dilution with fresh air takes place. Present practice favors the use of sulphur dioxide to extinguish mine fires. It is not only safe and efficient, but is also far less costly to produce than CO_2.

Aneroid barometers possess individual peculiarities which must be known for each instrument in order to employ them with safety. Without such knowledge, even the indicated difference of altitude between two near-by points, which may be reached before temperature and moisture-conditions in the atmosphere can have changed, is not to be trusted. Each instrument is generally reliable within certain limits of altitude, one being safe at low levels, another at moderate elevations, and so on. No aneroid barometer should be used for serious reconnoissance leveling until it has been thoroughly tested under partial vacuums corresponding to the atmospheric pressures at different elevations above sea-level. No aneroids possess a constant error throughout the range of pressures they are supposed to record. Furthermore, the errors once determined will not apply throughout the life of the instrument, this being due apparently to gradual relief of strain between the molecules in the corrugated metal plate. If an aneroid can be tested against mercurial barometers within the limits of altitude in which it is intended to work, it is better than to trust to the air-pump.

Roll crushing has an advantage over other methods in that it produces a more uniform product, that is, less pulverulent material which will pass a 200-mesh screen will be produced. For highest economy and efficiency the rolls should be set to crush the average maximum size of ore-particle fed to one-third its original diameter. Further reduction of volume at one crushing leads to excessive wear and tear on the machine, and is less economical in the end than division of the duty. Over-work in roll-crushing leads to high costs, and loss of time in making repairs.

Petrographic province is the term applied to a group of rocks having a chemical relationship indicating a derivation from a common parent magma by normal differentiation. The volcanic rocks throughout certain zones present this evidence of consanguinity, and within such a zone similar phenomena of ore deposition are likely to recur frequently. The identification of the eruptives at any locality as pertaining to some petrographic province in which the economic geology has been revealed by mine workings, may lead to warrantable inferences concerning the probable conditions attending a new deposit.

Dynamite should never be stored in tunnels, nor in any place where dampness exists. Although a tunnel may seem dry, all rock-in-place contains from 3 to 8% of moisture, which is continually being brought to the wall-surface in underground workings by capillarity, where it is evaporated unless, for want of ventilation, the air is saturated. Thus the rock is continually contributing moisture, which is greedily absorbed by the sodium nitrate in the dynamite, that salt being highly hygroscopic. As soon as the sodium nitrate has deliquesced, that is, melted from absorption of moisture, the homogeneity of the dynamite becomes disturbed, and the 'dope' fails to retain the nitroglycerine, which then leaks out. The watery substance often seen on cartridge-paper, and the oily stain seen in dynamite boxes, is due to the leaking of the nitroglycerine. A cartridge in this condition is far more liable to accidental explosion than sound dynamite, and it is perilous and uneconomical in use. It will not develop the same energy as good dynamite; it is likely to burn and blow out instead of detonating properly; and it is a frequent cause of 'mis-fires,' and of the failure of a charge to explode to the bottom of a hole. Dynamite must be stored in a dry place.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Gold Dredges Large and Small.

The Editor:

Sir—I was much interested in the articles in the MINING AND SCIENTIFIC PRESS recently on the subject of small dredges. This interest was added to when I read a similar article in the editorial column of a contemporaneous journal. The rather sudden interest in this subject has made me curious as to the cause, and for the good reason that, as the representative for several years of a manufacturer who did some work in this particular line, it never struck me that the people who asked prices on small dredges were in the same class with the operators in California. It is easy for a manufacturer of any line of machinery to understand why a small dredge of the same relative class should cost more than a large one. But it is hard to show that to a man who is not familiar with manufacturing. My efforts to sell a small dredge that would do work as satisfactorily as the large ones used to meet with frequent rebuffs on this account. With all this experience I can but say that the small dredge-buyer has not kept pace with others in the same line. Witness, if you please, the rise in price of the dredges in the California field within the last ten years. Cost has not been the prime consideration, otherwise the success attained would have been impossible. The essential has been to make something that would do a certain kind of work at a reasonable price. This obtained, and we have something upon which to base what a reasonable price should be. But until we had gotten the successfully working dredge, there was no basis whatever for making any statement of costs. It has been demonstrated so many times and at so many places, that it would seem as though lack of knowledge of what has been done would be the exception among people in placer mining.

The large investment necessary in building a dredge makes it impossible for a manufacturer to build them for experimental purposes, and the experiment would not be of value for every situation. The dredges which are doing such good work in California and other localities have been developed by the combined efforts of the manufacturer and the operator, and I see no other way to bring the small dredge up to that standard. There is undoubtedly a field for them, but the people who go into it must understand from the first that there is small chance that they can either buy as good a dredge for the same relative cost, or operate it as cheaply per cubic yard of dirt handled. These points tend to put difficulties in the way of the desired development, but should not be discouraging. I have designed several small dredges, all of which are working to the apparent satisfaction of the owners. One in particular was designed on the same general lines, as far as the arrangement and quality of the machinery is concerned, as the California dredges, and is working where it was not possible to determine fully what the conditions of the ground were. With this knowledge, I cannot agree that there are no successful small dredges, and in conclusion I wish to say that if the man who really wants a good small dredge will make his wants known in the right quarter, and will bear in mind that good engineering and an arbitrary price do not always go together, and that no dredge ever started, ran without small troubles, and sometimes big ones, he will have little difficulty in having his wants filled.

CARNEY HARTLEY.

Denver, September 23.

Cyanide Costs.

The Editor:

Sir—Can any of your readers supply figures for estimating the amount of royalties paid on the different systems of filtering slime? It is only fair, in estimating the cost of treatment, to include this item in each case, although I have failed to find in it any estimates. If this expense is included in the total cost, it would seem better to segregate it. C. W. Merrill claims to cyanide the Homestake slime for 24 cents per ton. Does this include his royalty?

A. DEL MAR.

Rawhide, Nevada, October 5.

The Editor:

Sir—The data submitted in the following tables show the precipitation-costs, including melting and acid-treatment of zinc shorts at the Pinguico mill, Guanajuato, Mexico, for the month of July, 1908. The table gives the data compared with similar results from the Liberty Bell mill and the Desert mill, the latter figures being taken from the MINING AND SCIENTIFIC PRESS of recent dates.

COMPARISON OF COSTS.

PRECIPITATION, MELTING, REFINING.

	Liberty Bell.	Desert.	Pinguico.
Ore milled, tons of 2000 lb...	10,548	13,830	6,927
Solution through boxes, tons	24,510	81,000	51,150
Precipitate recovered, lb....	1,275	27,947	11,026.4
Bullion from precipitate, oz.	16,016.8	291,412	123,359.5
Metal in precipitate, %.....	86.1	71.5	76.3
Bullion, fineness, Ag and Au	980	972.6	925.55
COSTS.			
Precipitation—			
Zinc and supplies	594.80	2,899.71	1,180.75
Clean-up and filter-pressing—			
Labor on boxes.....	43.50	519.45	77.56
Refining—			
Acid and labor.....	112.05	.....	165.37
Drying and melting.....	124.30	1,928.32	606.12
Totals	874.63	5,347.48	2,029.80
COSTS PER TON OF SOLUTION.			
Precipitation	$0.0243	$0.0358	$0.0230
Clean-up and filter-pressing...	0.0018	0.0064	0.0015
Refining	0.0096	0.0238	0.0150
Totals	$0.0357	$0.0660	$0.0395
Refining cost, per oz. bullion.	$0.0148	$0.0066	$0.00625
Total cost of precipitation, melting, etc., per oz. bullion	$0.0545	$0.0183	$0.0164

C. E. RHODES.

Guanajuato, Mexico, September 26.

Continuous Slime-Filter.

The Editor:

Sir—Referring to Mr. Schorr's article in your issue of August 8, I note that he mentions Bertram Hunt's sand-filter, and suggests that it might be well for Mr. Hunt, or others possessing data on the subject, to tell what they know about the method.

As filtering plays an important part in the economic reduction of ores by cyanidation, and as Mr. Hunt has adopted this principle of filtering in his continuous slime-filter, a few remarks based upon an observation and experience extending over nearly five years with this type of filter may prove of interest. In 1897 there were installed, under Mr. Hunt's direction, three of these filter-bottoms at the Black Oak mine, Tuolumne county, California, while working the tailing from the mill by the cyanide process. One filter was used in an 18-ft. vat, and the other two in two 8-ft. vats. The filter in the 18-ft. vat was used for three seasons. During that time the filter was taken out twice for the purpose of cleaning. It is obvious that this type of filter cannot be used in cases where the vats are cleaned by sluicing instead of by shoveling. For this reason it was necessary to use a single thickness of burlap to protect the filter-bottom. On all the rest of the vats, using the ordinary filter-bottom, two thicknesses of canvas or burlap were used, and the false-bottoms were removed once a month to clean out the sand which had accumulated beneath them. Of the material handled at the plant, 90% would pass a 100-mesh screen, 70% would pass 150 mesh, and about 4% would pass 200 mesh. This class of material at best leaches rather slowly, but a comparison of the two types of filters showed that the sand-filter gave a clearer solution, and leached more freely than the canvas or burlap-covered bottoms.

These two vats were used chiefly for experimental or testing work, generally for leaching purposes, but also for clarifying the solutions from the vacuum-pan. All kinds of material were leached in these two bottoms—slime, sand, and concentrate. For the last two years I used these filters exclusively for filtering solutions prior to passing to zinc-boxes. They were practically in daily use for one purpose or another for nearly five years. I examined them on several occasions and found that the material which had been worked on these filter-bottoms had not found its way to any extent down the V-spaces through the 10-mesh (coarse sand) filling, showing clearly that, where capable of application, the sand-filter outclasses in general efficiency, cheapness of construction and maintenance, any other style of filter-bottom, whether used for the leaching or merely as a clarifying medium. The method followed in the construction of these filter-bottoms at the Black Oak mine was as follows: upon the floor of the vat were first laid pieces of 2 by 2-in. scantling, planed, about 12 in. apart, and parallel to one another. These were notched at intervals on the under side to allow free circulation of the solution. Resting on these scantlings, triangular pieces (made by cutting 2 by 3-in. scantling diagonally) were placed. The edges of the bases were placed about ½ in. apart, the ends conforming to the circumference of the vat. In the V-shaped spaces was first laid sharp quartz passing a ¾-in. screen. Enough of this material was used to act as a retaining floor for the next layer of material, which was ¼-in. clean quartz. This was used to fill the V-spaces to about an inch from the top. Sufficient coarse sand (10 mesh) was then put in to level off. It would be natural to suppose that the sand and slime would eventually work down to the apex of the V-spaces, but it does not seem to do so to any appreciable extent. As soon as the filter has bedded itself, there will be no trouble with muddy solution. I have frequently used this type of filter in laboratory work, where I have found it equally efficient.

E. N. Walker.

San Francisco, August 20.

Constant Errors in Sampling.

The Editor:

Sir—I have been an interested reader of the Mining and Scientific Press for nearly three years, but during that time have seen no article upon the handling, shipping, and sampling of ores, along the lines of an investigation which I have followed at intervals, for some ten years. The results of this investigation are the conclusions that, first, there is no system or method of sampling ore that gives a correct sample; second, that any sample will 'favor the bulk of the ore'; and third, that the first sampling of an ore will usually show the lowest value, more especially on an ore in which the coarse material forms the bulk, and is of the lowest grade.

These rules might fail where an ore is entirely made up of galena, with a certain value in silver, and possibly some others, but on such ore as Cripple Creek and the greater part of Nevada produces, they will apply. Of course it has no effect on mining companies milling their own ore, but how about the mines that keep up sampling works and smelters? In every instance, with gold and silver ores (excepting galena) the bulk of the material is worthless. For example, take one ton of ore having a value of $100 in gold alone. We have approximately five ounces of precious metal scattered through 32,000 ounces of waste—rather a large proportion in favor of the poor material! Is it possible to sample this ore correctly? If this is the case the shipper is always the loser, and it may explain a portion of the graft in connection with sampling works and smelters which are generally supposed to make more on an ore than their charge per ton for treatment, and it seems impossible for certain ore-buyers to explain their immense profits.

The first experience I had along this line was in a 'high-grade' assay office in the Cripple Creek district, and was similar to this example: Take 9 lb. of ore assaying 100 oz. gold, figured as $1 per lb.; value of this lot $9; then take 1 lb. of ore at 1100 oz., or $11 per lb.; put them together and we have a total weight of ten pounds and a value of $20, or $2 per lb. No amount of mixing, nor any method of sampling will give a resulting assay of 200 oz. or $2 per lb. It will fall below.

The next case was on a dump-lease in the same district. The dump was screened and washed, an automatic cut-out was arranged for the sample of screenings, and the slime was sampled with a paddle. Experience in this line of work had given us the net dry weight per bucket of slime and screenings, and later shipments proved our sampling to be reasonably close. In the first 10-ton carload was approximately ½ ton slime assaying about $120 per ton; ½ ton slime assaying about $60 per ton; some screenings running $40 per ton; and the rest, in screenings, assayed $33.80. This was shipped direct to the smelter and was settled for at exactly $33.80, which was the lowest value of anything that had gone into the shipment. A number of cars shipped later, through the sampling works, brought returns of from $2 to $5 per ton more than the average of our assays, one car being re-sampled a number of times, and finally umpired and settled for on the last and highest assay.

The next case was at a Gunnison county, Colorado, mine, where I was assaying rich sorted ore. All ore assaying from $25 to $2000 per ton was thrown in and shipped together, giving assays of from 8 to 12 oz. gold, and, being a petzite ore, it also carried considerable silver. I spoke of the profit in grading ore, but no attention was paid to it until a new superintendent was put in charge, who said the same thing, so they concluded to save out a shipment of better grade. While assorting 1½ narrow-gauge carloads of ordinary ore, about five tons of better grade was saved that brought $2500, and the rest ran over 9 oz. gold per ton. So the management was forced to admit that the taking out of the better grade had not reduced the value of the balance $1 per ton, so far as they could judge.

At Goldfield, Nevada, in the winter of 1905-06, I looked after the sampling of a 1000-ton shipment made from one of the large mines to a local mill. The ore was settled for on the sample taken at the mine, the milling company having a representative on the work. The 'values favored the fines' most decidedly, which were in small proportion to the coarse rock. All was put through a crusher and shoveled back into the ore-house, and from there shoveled into wheelbarrows and dumped into wagons. As the shovelers loaded the wheelbarrows, every seventh to tenth shovelful was reserved for the sample. The first method was by coning, but as everyone knew the 'fines' were the best, this method proved unsatisfactory, so two samplers were made of heavy sheet-iron, set on edge, in the form of a cross, with a slope from the centre outward. On the centre was fastened a funnel, such as is used in filling sacks, but with a short pipe, 8 in. diam., making 4-in. quarters, which allowed the ore to drop quickly and freely. Into this was dropped, not poured, the shovelful for the sample, alternate shovelfuls from opposite sides, the flaring top of the funnel gathering the ore into an even heap as it descended on the cross. This makes a good sampler. About the time this contract was completed, the company secured a lease on another mill which was of small capacity, so some ore was sent outside, 15 carloads of which were shipped to a sampling works at Salt Lake, after being sampled in the usual way at the mine, but in 12 out of the 15 cars, or 80%, the ore ran higher at the sampling works than at the mine, the greatest difference being over $900 on one car. If we figure 25 tons per car, the difference in value was $36 or more per ton on ore that assayed nearly $100.

The question arises, what did the milling company make on the 1000 tons that were settled for on the sample taken at the mine? This would go to show that the first sample was considerably the lowest in value, so if the sampling works had the first sampling they could turn the ore over to the smelter at a big profit, over and above their charge per ton, and might still do so on the second sampling.

Some time ago there appeared in the MINING AND SCIENTIFIC PRESS several articles by T. A. Rickard on Goldfield, Nevada. One installment began by saying that "Goldfield has squandered its gold." Various reasons were given, but no reference was made to the loss occasioned by the reckless methods of handling and shipping ore, which I will venture to say was greater than that charged against 'high-grading.'

In the MINING AND SCIENTIFIC PRESS of September 5, 1908, there appeared an article by S. E. Bretherton, on 'An Automatic Ore-Sampler.' I could make a number of comments on this, but will make but one. Toward the end of the article he says, "Between the ore car and the chute from the crusher, pass the buckets of the sampler, so arranged as to time, size, and number, that an average of the coarse and fine is anywhere from one-twentieth to eight-twentieths, no matter how coarsely the ore is crushed." How is it possible to obtain an average sample of coarse and fine if the buckets are arranged as to time? It certainly takes longer for coarse material to pass through the crusher than fine, so the result of any time arrangement gets more of the coarse than the fine, and if there is any difference in value the sample will get it. The only reasonably correct method is arranged according to proportion.

R. I. GREEN.

Fairview, Nevada, September 28.

Heat-Loss Through Jacket-Water.

The Editor:

Sir—This experiment was made at Patagonia, A. T., by the writer upon a silver-lead blast-furnace in normal operation. The furnace was 36 by 120 in., with a 6-in. bosh and a smelting column of 15 ft., and was putting through 80 tons of charge daily, using a slag of 35% SiO_2, 27% CaO, and 28% FeO. The amount of jacket-water was 2000 gal. per hr., the water entering the jackets at 22°C. and leaving at 67°C., and therefore absorbing hourly 750,000 pound-calories. The coke used was 1000 lb. per hr., and allowing 7000 cal. per lb. gives a total of 7,000,000 calories. The jacket-water therefore absorbed 10.7% of the total heat. Besides the above, we have to consider radiation from the external surfaces of the jackets, the crucible, and the outer surfaces of the walls of the furnace.

L. S. AUSTIN.

Houghton, September 10.

BEYOND THE MISSOURI.

By Benj. Ide Wheeler.

*I recently heard a man account for a case of stagnating pessimism by saying: "They don't get out beyond the Missouri river often enough." The man who made the remark was the President of the United States, a man who himself absorbed a good deal of his fine sense for the essential mood and manner of Americanism through his own sojourning in the upland ranges and ranches behind that self-same river. There was a time when Mason and Dixon's line made the frontier between the two constituent moods and interests of the land; nowadays it is the Missouri and the lower Mississippi that mark the boundary between the nation's halves.

I have always noticed when the train passes North Platte coming west, that men stop wiping their necks at the edge of the collar, and that they begin to ask each other for a match, without reference to present condition of bank account or previous condition of servitude. By the time we have passed Buffalo Bill's ranch, agriculture begins to yield to grazing, men sit on top of the horse instead of behind him, and the hat brims grow stiffer. And then you begin to search for the concept hidden in the phrase, "beyond the Missouri river," and concept there must be—otherwise, what is the use of holding a Trans-Mississippi or Trans-Missouri Congress? And concept there surely is, for who has ever shifted his life from one side of this frontier to the other without feeling he is in another world.

If you look into the maps in the physical geographies, you will see that almost all the land beyond the river is painted brown in deepening shades; for most of it is over two thousand feet above the level of the sea. The trans-Missourians are nearer the stars, though farther from the safe-deposit vaults.

In the trans-Missouri region too the air is thinner, but the skin is thicker. It has to be—a little. The sticks are thicker. And almost everybody carries one. It is part of the individualism of the region that almost everybody is *it*, or prefers to be regarded as *it*—at any rate, it will generally be found profitable to treat him as such. This quality of *itness* is, in other words, somewhat more generally distributed among the population than over yonder. Hearts beats several times a minute more here than over yonder, but then, there is more here for hearts to do than there. Here the blood flows freer; there, the perspiration. But blood is thicker than water. Here the air is dryer; there, the hearts are dryer.

Here to the west of the Missouri is the land of elbow-room. Everybody feels it, and acts it. Everyone likes to wear his arms akimbo, and put the space to some good use. Do you know that though we have here but one-fifth of the population, we have a good half of the area, and surely two-thirds of the breeze. We are a breezy people in a breezy world.

On the other side they positively jostle against each other, so thick are they set. Massachusetts has 340 to the square mile; New York, 150; California but 9, and Wyoming but 1. When a man has a whole square mile to himself, if he does jostle, he is likely to have acquired momentum in getting there. And that is what we find in fact. Detached cars on a grade unite and come to a halt with less peaceful results than a well-coupled train. But it is glorious to be free and have room enough. The biggest men there are, the biggest-hearted and the most self-reliant, come from these breezy, free, square miles.

To the east of the Missouri they are wont to accept the rainfall as dispensed by Providence. They are like the Puritan settlers of New England, who voted to adopt the laws of God until they had time to make better. To the west of the Missouri they propose to put the water on the ground when and where they want it. It has an audacious ring, especially when there isn't any water in sight, but it is part and parcel of that whole endeavor of civilized and scienced man whereby he twists Nature to his uses, and by prying on her secrets, with what he calls his science, learns to domesticate her to his yoke and rule her by means of her own habits. The use of irrigation represents one of the highest and most characteristic activities of civilized life, and those who are forced to practice and develop it receive thereby high education, both in the scientific control of Nature and in the sociology of co-operation.

But there is one thing which, more than dry air or dry farming, more than heart-beats or elbow-room, more than grazing flocks, or teeming mines of yellow ore, or orchards of golden fruit, helps to yield the ultimate concept of "beyond the Missouri," and that is the long haul. Perhaps this is only a corollary of our elbow-room, but certain it is that our entire social and economic existence is conditioned by the fact that most of what we get and what we send must be carried over great spaces. In railroads we live and move, and in transportation we have our being. Material substances, whether ore or fruit or meat, are in themselves of no value, but only as they are set down where there is need and use for them. Wealth is created, not by growing anything or digging anything out of the ground, but by classifying material substances, and transporting and assembling them according to human need for their use. The railroads are our great public instrument for accomplishing this end, and nowhere is railroad transportation so closely wrought into the very life-physiology of a community as here beyond the Missouri. It is a matter of life and death. It is not raiment or ring, but tissue and blood. Their joint interests are not separable. The prosperity of the one is the prosperity of the other. A finer consciousness of this mutual interdependence and of a mutual responsibility would be advantageous to both.

But there is still one more item for our trans-Missouri concept. The early settlers of this continent occupied first a fringe of the Atlantic shore, and their faces were set toward Europe and the East. Then they pushed back into the interior, but they backed in; their faces were still set toward the Atlantic and the East. It was not until the prairie schooners had crossed the Missouri, that prows and faces were set toward the West. And now that we

*An address delivered before the Trans-Mississippi Commercial Congress on October 7. By courtesy of the author.

have found another ocean, and begin to see that our Nation has destiny and tasks in terms thereof—a destiny and tasks that well may make its future history to be as certainly controlled by its position on the Pacific facing Asia, as was its early history controlled by its position on the Atlantic facing Europe, portentous as these tokens are, it still remains that it is only the people of the prairie schooners and their successors who really set their faces toward the West.

So there is good reason for the Western people to assemble in convention. I am glad you are here and now living up to your right, and as incidental thereto I should be glad to have you visit Berkeley, and see a university we are trying to develop in accordance with trans-Missouri needs, for trans-Missouri uses, and for the general good of trans-Missouri people.

EUCALYPTUS FOR MINE TIMBERS.

Written for the MINING AND SCIENTIFIC PRESS
By A. H. MARTIN.

The growing scarcity of timber and the increasing cost attendant upon the demand, is causing concern to operators of mines throughout the country. Several of the cheaper and more common varieties of woods have been tested for mine timbering, and recent trials indicate that the common eucalyptus can be made to answer the purpose satisfactorily. The eucalyptus or 'blue gum,' is a native of Australia, but attains an excellent growth in the valleys of central California. The trees attain large dimensions in from ten to fifteen years, and at any time after the tenth year would be available for mine timbers. There are about 150 varieties of the eucalyptus, but only about ten of these are suitable for timbering or as substitutes for hardwoods. Large groves flourish in luxuriance in the Santa Clara valley, particularly near San Jose. The better varieties of eucalyptus are light, elastic, straight-grained woods. The trees can be grown in almost any soil, and after the third year require little care. They are exceptionally rapid growers and are said to be especially adapted to the desert regions of the West, provided that a small amount of water is available.

The railway companies have been quick to realize the value of the eucalyptus for commercial purposes, and both the Santa Fe and Southern Pacific have planted large groves. The Santa Fe railway has completed arrangements to send E. O. Faulkner, manager of its timber and tie department, to Australia, for the purpose of studying the various species of the eucalyptus. Mr. Faulkner will examine the trees with a view to obtaining the best varieties for planting in California, as the Santa Fe intends planting 500,000 during the coming year. Up to the present time the eucalyptus has been successfully raised only in California, but many timber experts believe that some of the hardier species could be grown in the Mississippi Valley. The Southern States are adapted to the rapid growth of the trees, but California will always be the largest grower.

The timber problem is rapidly becoming a most important one to mining men throughout America, and if the eucalyptus can be made to answer all demands it will result in a large saving for mine operators. Some species are practically impervious to decay, and will outlast any pine or spruce now in general use. With proper preservatives the life of the timber would be materially increased.

Throughout California, and in many parts of Arizona, Nevada, and Utah, it would be economy for mining companies to set out groves of trees as an adjunct to their mining operations. The yield per acre at each cutting would exceed 200,000 ft. board measure, and as a cutting can be made every 10 years, this averages 20,000 ft. per annum, which at $25 per thousand gives a gross value of $500 per acre per year. The cost of planting and cultivation will not exceed $320 for the 10-year period. The United States Government has been planting extensive areas to blue and sugar gum in the Tejunga canyon on the forest reserve near Los Angeles, and nurseries are being established to provide the young trees by the hundreds of thousands for setting out along the foothills of the Sierra Nevada, San Bennardino, and Santa Ana mountains. Irrigation is unnecessary if there is enough moisture in the soil to give the tree a good start and keep it going until the tap-root has penetrated deeply enough to get away from the superficial influences of drought.

Secondary enrichment is exemplified in the Granite-Bimetallic lode in the mine of the same name at Philipsburg, Montana. The lode is a tabular body of silver ore from 1 to 20 ft. wide, which has been stoped for 4500 ft. along the strike and 2600 ft. in depth. The vein fills a fissure in monzonite, along which there has been but little movement. The primary ore has a gangue of quartz and rhodocrosite enclosing a large quantity of pyrite, arsenopyrite, tetrahedrite, and tennantite, with some galena and zinc-blende. Sparingly scattered through this ore are small specks of pyrargyrite, realgar, and orpiment. This ore carries from 20 to 30 oz. silver and from $1.50 to $3 gold. Above the low-grade sulphides, extending from 500 to 1000 ft. below the surface, is a zone of enriched oxide and sulphide ore in which the primary ore is cut by veinlets of ruby silver, argentite, native silver, and horn silver. This ore carries over 100 oz. silver and $5 gold. Above the rich oxide and sulphide zone is a zone of leached oxides which extends to the surface. This ore carries less than 40 oz. silver and $2 gold. An analysis of the mine-water from a long drainage adit shows that it contains 0.000147 SO_4, 0.000160 iron, with traces of silver and gold. These figures indicate that about 0.6 of a ton of iron and sulphate compounds are carried out of the mine every 24 hours. It is well known that ferric sulphate solutions will dissolve silver, and that these are precipitated again by the action of sulphides. Enrichment was favored by a relief which furnished an ample head; by fracturing of the vein subsequent to the deposition of the primary ore; and by abundance of sulphides in the primary ore.—W. H. EMMONS.

THE ENGINEER AS A FINANCIER.

By John Hays Hammond.

On October 1 Mr. Hammond delivered his address as president before the American Institute of Mining Engineers. He said:

This is an era of expansion, and, conformably with the change in commercial conditions, the function of the mining engineer, as well as that of his confréres in many other professions, has also expanded. From his capacity of an engineer, limited to the determination of technical questions, the engineer of today has come to assume an economic importance in those branches of industry dependent upon engineering skill for their development.

He is indeed an engineer of limited usefulness who does not go further professionally than to submit a purely technical report on subjects presented for his consideration. While he has the same responsibility as formerly in the solution of the technical problems involved, he is further expected to supplement his report with advice on the financial and commercial aspects of these problems. For the great majority of problems presented to the engineer ultimately involve the determination of the pecuniary relations of the proposition under consideration.

The great corporation lawyer no longer earns his fee by merely submitting his opinion as to the legal issues involved in lawsuits affecting the corporation; he now assumes charge of the entire legal work, including both the organization of the corporation and the maintenance of its legal status thereafter. In like manner the engineer, whose report was, as I have said, formerly confined to the determination of the geological and other cognate features of a mining enterprise, is now expected, not only to embody information on these subjects in his report, but also to give his opinion whether the property offered for sale in pursuance of such an enterprise is worth the price asked for it.

Moreover, if he recommends the purchase of a property he incurs a certain moral responsibility for its efficient management, inasmuch as his professional reputation depends upon the realization of his predictions as to the outcome of the investment. For this reason the engineer passes from the rôle of an expert to that of a consulting engineer, bound to supervise both the technical and the business management of the property purchased by his clients.

With this additional responsibility and the consequent increase of professional opportunity comes an extension of the field covered by the ethics of the mining engineer. Our professional duty may be regarded from three points of view: First, the relation of our work to our employers; second, its relation to the investing public; and third, its relation to our individual interests.

The question has been often discussed among engineers whether it is professionally proper to make a report for the seller of a mining property. Such a practice has been sometimes condemned; but a little reflection will show that the condemnation is not warranted. For it is neither wrong nor unreasonable that the owner of a mineral property should desire to present such a statement of its nature and probable value as will secure the attention of possible purchasers; or that he should secure for such a purpose the assistance of one who knows how to make such a statement intelligently and in scientific language, i. e., the language which will convey a definite meaning to those who know it; or that he should pay such an assistant for his skill and labor. It goes without saying that no expert in such a case, or in any other case, may suppress or mis-state facts, or disguise or withhold his honest opinion in a statement to which he lends his name. Yet, this being a 'vendor's report,' is not advice to anybody to buy at a stated price, but only a description of the property (usually without any mention of the price at which it would be to the purchaser a profitable bargain). There is nothing dishonorable or unprofessional in honestly making, for the owner of the property, such a description. But there is often danger that it may be afterward used as if it were advice offered to a purchaser. In any such report, therefore, the fact that it was made for the owner or vendor, or his representatives, should be clearly stated beyond all misunderstanding, for the protection of both the author and the reader. This precaution being observed, I see no valid objection to the writing of such a report by a mining engineer.

Nevertheless, it is an undesirable kind of work, particularly for young mining engineers, whose reputation for integrity and judgment, not yet established by long practice, may be, justly or unjustly, placed in jeopardy by any such expression of their opinions, and may be destroyed, in public esteem, by the failure of any mining scheme with which their names may have been thus associated. In their own interest they should accept such engagements with caution, and protect themselves with vigilance against illegitimate or misleading use of their statements. In short, they take, in such cases, a risk which older engineers, backed by a reputation already established, could better afford to take. As between the two classes, the question is one, not so much of ethics as of practical wisdom; yet we may fairly say that the avoidance of folly is in no small degree an ethical matter. It is worthy of notice that the wise proverbs and warnings of the good old book often make no great distinction between 'fools' and 'sinners.'

In this connection arises the question of the acceptance of contingent fees. It seems to me that an expert of established and unimpeachable reputation is perfectly justified in recommending the purchase of a property and accepting compensation from the promoters; provided, first, and without qualification, that full publicity be given to the nature of his connection with the enterprise; and, secondly, that his compensation be contingent, not upon the successful sale of the property, but upon the subsequent success of the undertaking. In other words, an expert who makes a favorable report upon a mining property, for which he is to receive payment in money if the property be sold on his report, must needs have an unparalleled reputation for integrity to endure that revelation of this situation which he cannot

without dishonor withhold. But one who frankly avows that he is to be paid in the stock of the projected company, and therefore, as an investor of time, skill, and labor, is on the same footing as the investors of money, occupies a much less vulnerable position. In either case, and in any case, there is no safety—and, I may almost add, no honor—outside of the frank and full publication of all such circumstances as might be afterward called in question, criticised, or condemned.

This is the expert's golden rule: 'Tell unto others, now, whatsoever you would not have them tell on you (with unjust misunderstanding and scandalous comment) hereafter.'

Another question involved in the relation of a mining engineer to his employer concerns the acceptance of commissions from the sellers of machinery, supplies, etc., the purchase of which he has made as agent, or recommended as adviser. In many instances of similar nature affecting other professions, this practice seems to be established and condoned, if not avowedly justified. It is even defended by ingenious sophistry, somewhat as follows: The manufacturers of certain articles are bound by trade agreements not to sell them below a certain price, or, in the absence of such agreements, do not dare to 'cut' the price, for fear of thereby invoking savage reprisals from their competitors. But this minimum price includes the salary or commission paid to a regular selling agent. If, therefore, the agent of a customer makes a purchase direct, without the intervention of their sales agent, they are willing to pay him 'the regular commission,' though they are not willing to reduce by the same amount their bill to the employer. The argument is plausible from the manufacturer's standpoint, and indeed it is hard to judge him justly. For if, in a given case, in order to gain a customer, he undersells his competitors, he may be committing the heinous modern sin of giving a 'rebate'; whereas, if he refuses to do this, he may be guilty of partnership in a wicked trust or combine. The popular sentiment and legislative furore which condemns at the same time free competition in prices and every agreement to prevent such competition, needs, as President Roosevelt has in substance frankly declared, to be modified by common sense.

But we are now concerned with the ethical or legal problems of the manufacturer. From the standpoint of the engineer, acting as purchasing agent or adviser, the case seems as clear to me in a court of honor as it would be in a court of law. He cannot honorably accept a commission from the seller while he is the agent of the buyer. If the custom of the trade permits the giving of such commission, but not its deduction from the face of the bill rendered, he may, of course, honorably accept it and pay it over to his own employer—that being the only way in which he could secure the minimum net price in his employer's interest. But even in that event, he should place his honor above suspicion—as, for instance, by commanding the commission in a check to his own order, and endorsing the same check to the order of his employer. There may be exceptional cases in which the taking and keeping of a commission is justifiable, but one thing is clear beyond dispute: it is always wrong when it needs to be kept silent.

It seems almost superfluous to insist upon the duty of maintaining a spirit of loyalty toward employers. Yet this spirit is by no means as prevalent as a sense of honor, or even of enlightened self-interest, would demand. Loyalty to a corporation should be as unquestionable as to an individual. In neither case should it be sacrificed to feelings of personal resentment or disapproval. If one cannot 'stand for' the policies or practices of one's employer, the straightforward course is to seek employment elsewhere.

There are two special spheres in which the mining engineer, like the members of other technical professions, maintains a double relation. One of these is that in which, being himself an employee, he exercises the employer's authority over other employees. In such a position, while it is his duty to protect vigilantly his employer's rights and interests, he should realize that he cannot do this more effectively than by invariable justice, good nature, respect, and sympathy toward his own subordinates. Nothing contributes more toward the success of an enterprise than the mutual exercise of these feelings between workmen and superintendents or managers. It is the 'team work' that wins in industrial undertakings as well as in the athletic field. And in these days especially it is the cultivation of an *esprit de corps* based upon truly friendly personal relations, which offers the best protection against the schemes of mischief-makers and demagogues.

The other double relation to which I have alluded is that which is occupied by an expert witness in a court of law. In this case he is, theoretically *amicus curiæ*, a friend of the court, giving under oath his assistance in the recognition and interpretation of the facts of the case; and, for this reason, he is permitted to do what no ordinary witness can do, namely, to give opinions as well as personally observed facts, and to support these opinions by hearsay evidence or scientific authority and argument, not otherwise admissible as testimony. Yet, on the other hand he is retained and paid by one of the litigant parties; and he would not appear in court at all were it not reasonably certain beforehand that his testimony would support the theory and benefit the cause of his clients.

The ethics of this situation may be more clearly perceived if we consider that, first and foremost, the expert witness must remember the obligation of his oath. He has not the same latitude as the attorney, whose official duty is to present a client's case without declaring his private opinion about it. Consequently, the expert witness should be thoroughly convinced beforehand of the justice and truth of the cause or the theory in support of which he appears. Such a conviction ought to be based upon a careful and exhaustive previous examination of the case; and no expert should agree to testify in any case until such an examination has established his opinion and qualified him to defend. Concerning some aspects of this question I would here refer, without

further discussion in this place, to the suggestive address of Dr. Raymond, printed in the proceedings of the American Institute of Mining Engineers for November, 1908.

A more simple and congenial, yet more heavily responsible, relation is that which the mining engineer may be called to assume toward the public, as the responsible indorser of a proposed undertaking. In consideration of the confidence which he invokes and expects, notwithstanding the fact that he has been paid by interested parties, he assumes a sacred trust, obligating him to safeguard the interests of a wider and more important clientele. The investor has not the time, and perhaps not the technical knowledge, required for the thorough study of a prospectus. He risks his money upon his belief in the ability and integrity of the engineer, who is therefore bound, in prudence and in honor, to be specially careful that his endorsement be clear and precise, without mental reservation or opportunity for misunderstanding. This caution applies particularly to what are called 'gilt-edge' investments, that is, to enterprises so promising and so thoroughly investigated beforehand as to warrant their recommendation, on the terms stated, to the general public —that is, to unknown and probably unskilled clients. There are numerous instances in which the engineer has to give advice on speculative, though honest and legitimate, undertakings, such as the development of mining prospects, which should be confined to those who are willing and can afford to take greater risks, in the hope of larger profits, than pertain to the 'gilt-edge' class of mining investments.

In connection with the class of advisory reports last named, it is good policy for the expert adviser to seek to acquire a special clientage among mining investors who will not be led to judge him by the results of a single case, but, knowing the wisdom and the successful outcome of his recommendations in other cases, will not condemn him when he turns out to have been mistaken. For such a disappointment, sooner or later, is inevitable, since no engineer, however able and careful, is infallible.

In my opinion, a mining engineer engaged in such consulting practice should aim to become himself a capitalist and a purchaser and developer of mining properties. Should he acquire business experience, he might become avowedly a promoter, in a high and worthy sense of that term, and thus assist in driving out the unscrupulous promoters, who are really parasites. According to my observation, the swindling in mining enterprises is done mostly by laymen, and not by responsible professional engineers or practical miners. The practical miner indeed is, in many instances, the victim of the unscrupulous promoter.

As already observed in considering the relations of the engineer to the public, it may also be repeated from the standpoint of his own interests, that he should use the greatest circumspection to prevent the use of his name in support of enterprises of which he has but a superficial knowledge. He may be quite willing to 'take the chances' and invest some of his own money in a scheme which he would not be willing to take the responsibility of recommending to another party, dependent upon his judgment as a guide. But even such a private investment of his own money should often be avoided, lest his connection with the scheme as a simple stockholder should be construed as implying his deliberate indorsement of it as an expert.

It often happens that an expert who has won deserved reputation and public confidence is called to give advice concerning a district with which he is not personally acquainted. In such a case his honest off-hand judgment, based upon general knowledge and upon experience elsewhere, might mislead both himself and others. Yet it is practically impossible for an expert, visiting a given property or district for the first time, and, of course, known to all as the possible 'advance agent' of capital, to get at the unfavorable conditions which it is everybody's interest to hide. I would earnestly recommend, in such cases, the engagement by the examining expert, at his own selection and cost, and without notice to any other party, of a local expert assistant, familiar with the conditions and history of the property concerned and of the district in which it lies—in other words, with those facts which a visitor cannot really discover.

I am fully aware that these desultory remarks have covered but a small part of the field of professional ethics, even in a single branch of the profession represented by the Institute. But I am not offering a code, or even an official and representative declaration of principles. My remarks are intended, and will, I hope, be accepted, simply as a contribution to that discussion of their theme in which every engineer of experience may participate.

IRIDIUM INSTEAD OF PLATINUM FOR CRUCIBLES.

Sir William Crooks has been experimenting with wrought iridium crucibles for use in ordinary chemical analysis, instead of platinum crucibles. He gives an account of the results obtained in a short memoir published in a recent issue of the '*Proceedings* of the Royal Society'. Iridium is as hard as steel, and does not blister or alter in weight when repeatedly heated to redness. Prolonged heating in a Bunsen flame with a yellow tip has no action on the crucible other than to temporarily smoke it, nor does gas high in sulphur injure it. Boiling aqua regia is without action upon the metal, and phosphates at a red heat in the presence of a reducing agent do not affect it. The metal shows no tendency to alloy with lead or zinc at their boiling points, nor with molten nickel, iron, or gold. The crucible when cleaned after the foregoing metals have been melted in it shows no change in weight. Prolonged heating with copper makes the crucible brittle when hot. Fused caustic alkalies attack the metal, but less markedly than they attack platinum. Rhodium crucibles were found to be almost equally resistant and to have the advantage of greater cheapness, while they possess only about half the weight. Sir William Crooks has put the crucible to a more severe test than any analyst is ever likely to give it.

DETERMINING THE TRUE MERIDIAN.

Written for the MINING AND SCIENTIFIC PRESS
By A. W. WARWICK.

A simple and accurate method for the determination of the true meridian, such as does not involve the use of watches and clocks nor necessitate knowledge of geographical position, seems to warrant publication. During the last few years I have been acquiring a number of mine titles in Mexico, where all surveys must be in accordance with the true meridian. It soon became evident that, except for rough work, the ordinary published methods failed with the regular mining transit in the remote regions where the work was done, for the following reasons: 1. Mean solar time could not be determined (a) owing to the high meridian altitude of the sun for six months in the year, reaching 89° 30′ in June, (b) owing to the latitudes being unknown, time could not be determined off the meridian. 2. To get telegraphic time often involved four to six days' ride, with consequent time-error due to jolting or accident, besides the change due to the regular time-rate of the watch. 3. Observation at elongation of Polaris is sometimes impossible in the spring and autumn months owing to both elongations occurring in daytime. A number of methods exist for obtaining time roughly, but these are not satisfactory as a basis for determining the meridian, even when using Polaris near elongation. Later I resorted to straight astronomical methods, by finding sidereal time, converting to mean solar time, making the watch correction, calculating the hour-angle of Polaris, and correcting for azimuth. While this gives the array of figures and conversions so dear to the heart of the computer, they are really all unnecessary, besides requiring a Nautical Almanac, which is not always available. The method that I finally evolved obviates reference to faulty watches or any calculation whatever, and by reference to a single table will give the azimuth correctly within a minute. Latitude is also correctly determined, as well as time, within a few seconds, at practically any hour of the night. To make the method more striking, no knowledge of geographical position is necessary, or really any knowledge of astronomy, as the stars are found automatically beyond any possibility of doubt by means of the transit.

Table 2 herewith given was computed for stars convenient in latitudes 25 to 30° N and for the year 1908. It can be used for other latitudes and other years by means of coefficients given in Table 1. Table 2 gives all the elements for determining azimuth as well as all data necessary for finding the stars and for determining latitude. Some convenient notes are given for selecting the stars to be used. Before giving examples of its use or demonstrating the accuracy of the method, it may be well to explain briefly some of the terms.

The term right ascension (R.A.) is a constant bugbear to the young surveyor. Consider it as sidereal time and most difficulties vanish. A sidereal day is the interval of time between the two successive upper transits of a fixed star. This interval of time is divided into 24 hours of sidereal time. There must be a zero or 24 o'clock. This zero is the vernal equinox which, just like a star, transits (or crosses the local meridian) every 24 sidereal hours. Then when we find in the table that Sirius (or α Canis Major) has a right ascension of 6 hr. 41 m., it simply means that when Sirius is on the meridian of the place of observation the sidereal time is 6 hr. 41 m. The R.A. of Polaris is now 1 hr. 26 m., that is, it is on the meridian at 1 hr. 26 m., according to the sidereal clock. Therefore, when Sirius is on the meridian Polaris has passed it 6 hr. 41 m., minus 1 hr. 26 m., or 5 hr. 15 m. earlier. Thus the hour-angle of Polaris is 5 hr. 15 m., sidereal time, when Sirius is on the meridian of the place. The orbit of Polaris around the pole is accurately known and from the hour-angle its azimuth can readily be calculated.

In the method used, only sidereal time is employed, since to convert it into mean solar time, and then use watches or clocks, is merely to re-introduce perfectly

TABLE OF COEFFICIENTS
To Reduce Latitude and Azimuth for Different Years and Latitudes

	Lat.	1908	1909	1910	1911
Azimuth Coefficient	20°N	0.788	0.784	0.781	0.777
	30°	0.862	0.856	0.850	0.845
	40°	0.972	0.966	0.960	0.954
	50°	1.12	1.13	1.14	1.14
Latitude Coef.		0.968	0.964	0.960	0.956

Example Lat. 30° Obs. at 15h 55m Sid. time Jan. 1908
Az. Corr +58′ × 0.862 = + 55′
Lat. Corr + 57′ × 968 = + 55′

Table 1.

useless complications. The transit of a star is observed, the R.A. is then the local sidereal time, which is immediately used on Polaris, and the azimuth correction given in the table is laid off without any calculations whatever. Of course, at once, the query arises how is the time-star to be found among the countless host without a thorough knowledge of astronomy? It is perfectly easy. The approximate latitude and meridian are to be determined just before the observation of the time-star, as explained later. The telescope is laid approximately in the meridian across which the star is to transit. The altitude of the southern time-star is found by adding its declination to the latitude and subtracting from 90°, or

$$\text{Alt.} = 90° - (\text{dec.} + \text{lat.})$$

Setting the vertical arc to this angle with the telescope in the meridian pointing south, no other star of the magnitude of the time-star will be seen for a long time before or after its transit. Hence no doubt can be felt as to the identity of the star observed. Simple instrumental adjustments will find the star sought beyond any possible doubt.

In order to select the star for observation the sur-

veyor will find in Table 2 the mean solar time of transit for the first of the month at those dates when each star is convenient for early morning or evening observations. Thus, if we wish to observe in the evening during December, two stars in the constellation Ceteus are available (β Ceti or ξ Ceti), Beta transiting 47 minutes before Polaris and Zeta 21 minutes after. If in the morning γ Corvi, or Spica, might be used.

A very convenient method of choosing a star is by directly reading the stars themselves with the eye. In the circumpolar constellations we have Cassiopeia and Ursa Major (the Big Dipper), an excellent sidereal clock, which can be read even with the uneducated eye sufficiently closely for all practical purposes.

When Polaris is at its upper culmination the constellation Cassiopeia will be vertically above it and

TABLE OF TIME STARS

With Azimuth & Latitude Corrections & Times of Transit.

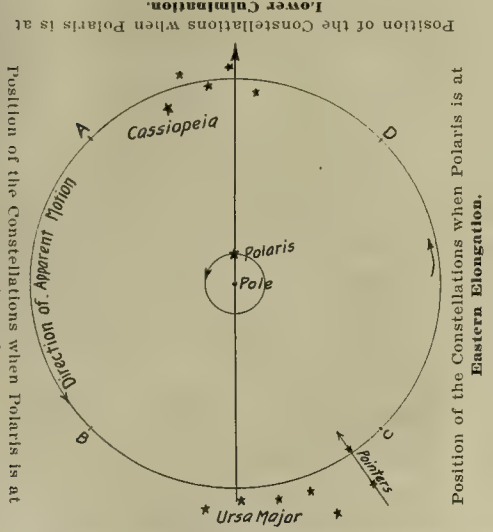
For use on Polaris 108° W. Longitude.

Star	Mag.	R.A. h.	R.A. m.	Decl. S. °	Decl. S. ′	Correction Az. m.	Correction Lat. m.	P.M. Mean Time Transit. 1st day month	P.M. h.	P.M. m.	A.M. 1st day month	A.M. h.	A.M. m.
β Ceti	2.	0	39.	-18	30	+20	-73	Dec.	8	0	Aug	4	1
ζ Ceti	3.5	1	47	-10	48	-8	-74	Dec.	9	8	Aug	5	6
Polaris	2.	1	26	+88	49	-0	0	Dec	8	47	Aug	4	46
ϵ Eridani	3.5	3	29	-9	46	-50	-65	Jan	8	47	Sept	4	47
γ Eridani	3.	3	54	-13	46	-58	-58	Jan	9	12	Sept	5	12
Rigel	1.	5	10	-8	19	-80	-41	Feb	8	26	Oct	4	30
α Leporis	2.5	5	29	-17	53	-84	-36	Feb	8	45	Oct	4	49
α Columbae	2.5	5	36	-34	7	-85	-34	Feb	8	52	Oct	4	56
Sirius	1.	6	41	-16	35	-94	-14	Mar	8	6	Oct	6	1
ϵ Canis Majoris	1.5	6	55	-28	51	-95	-9	Mar	8	23	Oct	6	15
δ Canis Majoris	2.	7	5	-26	15	-95	-6	Mar	8	33	Nov	4	23
α Hydrae	2.	9	23	-8	15	-82	+37	Apr	8	46	Nov	6	41
γ Corvi	2.5	12	11	-17	2	-30	+69	May	9	35	Dec	7	30
Spica	1.	13	20	-10	41	-2	+72	June	8	43	Jan	6	30
α^2 Librae	3.	14	46	-15	39	+33	+68	June	10	8	Jan	8	2
δ Scorpii	2.5	15	55	-22	21	+57	+59	July	9	18	Feb	7	9
Antares	1.	16	24	-26	14	+65	+52	July	9	47	Mar	5	47
η Ophiuchi	2.5	17	5	-15	37	+78	+41	Aug	8	27	Mar	6	28
λ Sagittarii	3.	18	22	-25	28	+92	+20	Sept	7	42	Apr	5	43
σ Sagittarii	2.5	18	49	-26	25	+94	+11	Sept	8	8	Apr	6	10
α^2 Capricorni	3.5	20	13	-12	50	+93	-15	Oct	7	35	May	5	36
β Aquarii	3.	21	27	-5	59	+83	-38	Oct	8	49	May	6	50
α Gruis	2.	22	2	-47	25	+74	-46	Nov	7	22	June	5	23
Formalhaut	1.5	22	53	-30	7	+46	-58	Nov	8	13	July	4	15

For each day previous to the 1st. a star will transit 3.93 minutes later & for each day after 3.93 minutes earlier: thus β Ceti will transit Dec. 15th. 3.93 x 14 = 55′ earlier or at 7.05 mean solar time.

Table 2.

Ursa Major vertically below. Cassiopeia then forms a brilliantly marked M of stars as bright as Polaris. A vertical line will pass between the last two stars of Cassiopeia, down through Polaris and between the first and second stars in the handle of the Dipper. It is then 1 hr. 26 m. sidereal time. The first quadrant west will be made six hours later, or at 7 hr. 26 m. sidereal time. Ursa Major will be vertically above and Cassiopeia vertically below Polaris 12 hours later, or at 13 hr. 26 m. sidereal time. Cassiopeia will be in the last quadrant 18 hours later, or 19 hr. 26 m. sidereal time. When Cassiopeia is at A.B.C.D. the times will be 4 hr. 26 m., 10 hr. 26 m., 16 hr. 26 m., 22 hr. 26 m., respectively. Therefore the line mentioned is used as an alidade, the end terminating in Cassiopeia, giving on the circular path of that constellation the approximate sidereal time. With hardly any practice this dial can be read to within 15 minutes of sidereal time or right ascension. Without any reference, therefore, to the Nautical Almanac, or to a badly running watch, local sidereal time can be read at once. If the circumpolar stars



Position of the Constellations when Polaris is at **Upper Culmination.**

show 4 hr. 26 m., for example, about the time of observation a star is selected with a right ascension sufficiently great to allow a good set-up of the transit. Rigel, coming on the meridian at 5 hr. 10 m., is a suitable star, allowing forty minutes for error in reading the circumpolar stars and for time to set up the instrument. If a gross mistake has been made α Leporis transiting 19 minutes later and α Columbae, 26 minutes later, can be used.

With these explanations the method for determining the true meridian can be readily followed. It is assumed that the instrument is in good adjustment. If not, the observation must be made near elongation, when the horizontal component is changing slowly, in order to be able to use the familiar method of reversals to eliminate instrumental errors. It is highly desirable to adjust the instrument, however, in order to be able to get correct time with direct observations.

The following operations are carried out:

1. Having set the instrument over a hub on the south end of a line with a clear view to the north of about 500 ft., read the circumpolar stars and get approximate sidereal time. Select a star that does not require a tedious wait.

2. With the verniers at zero, set on Polaris with the lower motion. Read the vertical angle. Set off the azimuth called for by the sidereal time, and apply the latitude correction to the vertical angle. These corrections are given in the table.

3. Plunge the telescope or move the instrument exactly 180° in azimuth. Set the telescope at an altitude of 90°—(declination of time star + latitude).

4. If the star has been well selected, it will be nearing the meridian. It will be in the field of vision about two minutes before crossing the vertical hair. When the star reaches the field of vision, it is followed in altitude by the tangent-screw of the vertical arc.

5. When the star is on the vertical cross-hair the vertical arc is read rapidly. The telescope is plunged or turned 180° in azimuth. The upper motion is unclamped and the plates set at zero. The vertical arc is once more set at the altitude of Polaris, which will be again in the field of vision. Set the star on the cross-hairs by the vertical tangent-screw and the lower motion. Read the vertical angle for latitude.

6. From the table, take out the azimuth correction and set off in the usual way. Correct the vertical angle by the latitude correction given, which also includes refraction correction.

The following example shows the working:

December 15, 1907, Pino Alto, Sinaloa. Local mean time, 6:45 P. M. Sidereal time, about 0 h. 25 m. Time-star β Ceti: R.A., 0 h. 39 m., Dec. —18° 30′. Az. corr. + 18′. Lat. corr. — 72′. Vertical angle of Polaris, 28° 02′.

Vertical angle	28° 02′
Correction	1° 12′
Latitude	26° 50′

Calculated Altitude of β Ceti:

Lat.	26° 50′
Dec.	18° 30′

90° — 45° 20′ = 44° 40′ Alt. of star

Observation on β Ceti:

Watch time of transit	7h. 06m. 30s.
Altitude	44° 44′

Second observation on Polaris:

Correct azimuth correction	+ 18′
Altitude	27° 57′

Correction for azimuth, set off to the west 18 minutes.

Observed latitude on β Ceti:

90°—(44° 44′+18° 30′)=26° 46′—1′=26° 44′

Observed latitude on Polaris:

27° 57′ — 1° 12′ = 26° 45′

Computed time of transit	7 h. 05 m.
Watch time	7 h. 06 m. 30 s.
Approx. watch error	1 m. 30 s.

The error of the meridian line thus set out will be less than 1 minute, in spite of a considerable error in the meridian line set for the determination of time. The following calculation will demonstrate this: The time elapsed between the observation on β Ceti and Polaris was 21 minutes. The observation was made near culmination when Polaris was chang-

ing 0.43 minutes of arc for each minute of time. The error of the meridian line was, therefore, 9 minutes of arc. The resulting time-error can be calculated from the formula:

$$\text{Time error in sec.} = \frac{\sin (\text{lat.}-\text{dec.})}{\cos. \text{dec.}} \text{ Az. error in sec.}$$

The error of time was, therefore, 32.8 seconds. Now as even at culmination it takes 2.5 minutes of time to cause a change in azimuth of one minute, an error of 33 seconds is absolutely negligible for our purposes, as the induced azimuth error is less than 15 seconds. As a matter of fact, if the time-observation be made within half or three-quarters of an hour after setting on Polaris, and without first making a partial correction for azimuth, the final azimuth error is less than a minute. The following table shows this clearly: Lat. 30° N.

Hour-Angle Polaris. Hr.	Min.	Meridian error. Min.	Time-error. Min.	Sec.	Time required to cause change of 1′ azimuth. Min.
0	0	0	0	0	2.5
0	2.5	1	0	3.6	2.5
0	30	10	0	37.0	2.6
3	00	60	3	39.5	3.5
6	00	80	4	52	15.0
12	00	0	0	0	2.5

Thus, if we use a meridian line 1° 20′ in error the time-error is only 5 minutes. As Polaris is moving so slowly in its horizontal component, even a 5′ error of time will not cause an error of 1′ of arc. By the method given the time-error will never exceed 35″, and near elongation it will be in error less than 5″ if the instrument be in adjustment.

Should there be any doubt as to the adjustments of the instrument, the familiar method of reversal can be used, observing the time-stars as they come to the meridian. There is rarely, however, any excuse for having the instrument in such bad adjustment that the surveyor has to spend hours in making a correct determination of the true meridian. The time thus wasted would be more profitably spent in adjusting the instrument.

In order to get time correct enough for watch adjustment, simultaneously with latitude and azimuth, I slightly modify the method given. If the telescope is in a meridian slightly west of north and east of south, the time observed on a southern time-star will be fast. Therefore, the first observation is made so as to get time about 5′ fast. Using this closely approximate time, the telescope can be laid in the meridian within a minute or two. Sidereal time is then determined within from 3 to 5 seconds, and the meridian determined far within the limits set by an instrument that reads only to the nearest minute.

In the table given + in the azimuth correction means that Polaris is east of the meridian, and of course — means that it is west. The latitude corrections are applied direct to the altitude according to the algebraic signs.

The working of the method is simple and requires no special skill. A little practice will enable the surveyor to recognize, by simple inspection, every star used, and thus enable him to select the star that will soonest come to the meridian, thereby avoiding long tedious waits and allowing the work to be done in a reasonably short time.

The mineral production of California during 1907 is given by the State Mineralogist as $55,697,949, being an increase of $8,921,864, or 19%, over that for 1906. The detailed statement of the principal minerals contributing to this total is as follows, arranged in order of relative value of the products:

Relative No.	Mineral.	Quantity.	Value.
1	Petroleum	40,311,171 bbl.	$16,783,943
2	Gold	809,213 oz.	16,727,928
3	Copper	32,602,945 lb.	6,341,387
4	Brick	362,167 M	3,438,951
5	Cement	1,613,563 bbl.	2,585,577
6	Borax	106,825,000 lb.	1,200,913
7	Macadam	1,544,617 tons	1,082,302
8	Asphalt	79,718 tons	1,058,400
9	Rubble	744,271 tons	832,713
10	Lime	684,218 bbl.	756,376
11	Silver	1,138,858 oz.	751,646
12	Quicksilver	17,379 flasks	663,178
13	Mineral water	2,924,269 gal.	544,016
14	Limestone	230,985 tons	406,041
15	Granite	399,431 cu. ft.	373,376
16	Salt	88,063 tons	310,967
17	Pottery	160,385 tons	254,454
18	Gems	.....	232,642
19	Paving blocks	4,604 M	199,347
20	Sandstone	159,573 cu. ft.	148,148
21	Tungsten	.....	120,587
22	Marble	37,512 cu. ft.	118,066
23	Natural gas	169,991 cu. ft.	114,759

The feature of the year was the advancement of petroleum to the first place, surpassing gold in the value of output for the first time. The production of gold and silver fell off $2,070,708 in 1907, as compared with the preceding year. Metallic substances, including precious metals, represent $24,896,083, which is a decrease of $1,206,619 as compared with the production of 1906. The decrease is less than in the case of precious metals.

The production of chrome ore in the United States is an insignificant figure when compared with the consumption, the total output in 1907 amounting to but 290 long tons, valued at $5640. The maximum production of any one year (1894) was 3680 long tons, valued at $53,231. This value was, however, slightly exceeded in 1890, when the output amounted to 3599 long tons, valued at $53,985. The demand is supplied from foreign sources, chiefly Asiatic Turkey and New Caledonia, and the imports during 1907 amounted to 41,989 long tons, valued at $491,925.

The total capacity of prime movers in the United States in all classes of land industries for the year 1908 is estimated by H. St. Clair Putnam, in a paper recently read before the American Institute of Electrical Engineers to be 30,000,000 horsepower. It is probable, however, that the total average load does not exceed one-third or one-quarter of this amount.

The tangent of one second is 0.00000485, or, roughly, 5 zeros and a 5. This makes a convenient rule for finding the tangent or sine of small angles, since for angles less than one minute the sine and tangent are approximately directly proportional to the value of the angle, and of course the sine and tangent are of the same numerical value.

AMARILLA IRON AND PHOSPHATE DEPOSITS.

Written for the MINING AND SCIENTIFIC PRESS
By OSCAR H. HERSHEY.

The Amarilla group of seven mining claims is situated on the eastern slope of the Cortez range, about six miles westerly from Lane's Crossing on the Eureka & Palisade railroad, in Eureka county, Nevada. The present title to these iron claims dates from their location, between June 24 and July 30, 1905, by me for M. L. Requa; they subsequently came into the possession of the White Pine Exploration Co. The name Amarilla was suggested by the fact that the best deposit was nearly covered by yellow flowers. The altitude is about 6900 ft. There is no timber in the range except small groves of cottonwood near many small springs in the gulches. The climate is delightful in summer and not very severe in winter, so that there would be no difficulty about carrying on mining in open-cuts all the year.

The Cortez range in the vicinity of the Amarilla property consists chiefly of Tertiary rhyolites, apparently in a succession of thick sheets. As I have not visited the locality since 1905, and as my reports were destroyed in the San Francisco fire, I cannot specifically describe the lavas; some of the sheets may be more basic than rhyolite. Within the series there is a moderately coarse light brown and red sandstone. It is rarely more than 100 to 200 ft. thick, but in the vicinity of the Amarilla property it attains a thickness of over 700 ft. The old Paleozoic basement is nowhere exposed in this portion of the range, and is probably deeply buried under these Tertiary sediments and volcanics. The latter have been tilted at many angles and deeply cut by the erosion of gulches. The iron and phosphate deposits occur in the first thick sheet of rhyolite above the sandstone. The iron ore of commercial grade is a fairly compact, fine to medium grained, black crystalline hematite, that outcrops prominently in places, and in others weathers to a dark red soil. Fine-grained quartz occurs in seams, and there are small inclusions of altered rhyolite at many places in the ore. Small yellow crystals of apatite are present in all parts of it. There are six important bodies; the prevailing shape is that of an inverted canoe. On the basis of the vertical range of the outcrops I estimated them to contain as follows:

	Tons.
Amarilla No. 1	375,000
Amarilla No. 2	750,000
Alameda	93,750
Contra Costa	250,000
Capitola	63,750
San Diego	15,625
Total	1,548,125

Subsequently, an adit was driven to pass under No. 1 orebody, and it has demonstrated that that orebody at least extends much deeper than at first assumed. Fourteen samples showed an iron content ranging from 47.30 to 60.10%, and averaged 56.26%. A partial analysis made by H. A. Ross of a selected sample that assayed 63% iron, yielded free silica 5.67, lime 0.70, phosphoric anhydride 1.26, and combined water 1.18%. Another sample yielded 9.90% insoluble silica, and other tests indicate that the excess of iron over silica is nearly 50%. Besides these orebodies, there are large masses of lower-grade material; some is a breccia of altered rhyolite in rather large fragments cemented by hematite; other large bodies are soft, earthy, impure hematite ore, assays on which range from 41 to 47.40% iron. There is practically no gold and silver present in the iron ore, although traces of gold are sometimes found in assaying. Cutting the rhyolite in various directions near the orebodies are veins of fine-grained quartz and hematite that usually yield traces of gold and silver. One on the eastern border of Amarilla No. 1 orebody assayed 40c. gold per ton. They were not usually assayed for iron, but a 2½-ft. flat-lying vein at the contact between the sandstone and the overlying rhyolite contained 42% iron. The relatively high phosphorus content prevents the iron ore from being attractive at present for the production of iron, although in parts of Europe it would be smelted and the phosphorus recovered as a by-product. Its isolation in a sparsely settled country, the scarcity of fuel, and the high transportation charges are against it; but it has a possible present value for flux. A much smaller deposit of similar character has been mined for years at Barth, on the Central Pacific railroad, and shipped to the smelters for that purpose. To make the Amarilla deposits available it will be necessary to build a 7-mile spur to the narrow-gauge Eureka & Palisade railroad. This spur will ascend a small valley, rising from 5150 to 6250 ft. above sea-level, and may cost $35,000. It is only a question of a little time before the value of these deposits as a source of iron will be recognized. The rhyolite inclusions, and the large bodies of rhyolite in the vicinity of the iron, have been highly altered and contain a rather unusual grouping of contact-metamorphic minerals. Fairly large distinct crystals of a yellow mineral were found in the rhyolite of the Monterey claim, and were submitted to A. C. Lawson of the University of California, who identified them as apatite.

While having the location work done on the iron deposits, I became interested in obscure outcrops and loose fragments of a rock which at first I thought was sandstone, but when the sun shone on it a peculiar glitter suggested reflection from crystal facets. Later I found some sufficiently coarse to enable me to distinguish apatite crystals with the unaided eye, and it became apparent that all of this supposed sandstone was fine-grained apatite rock. It occurs in bodies near but distinct from the iron orebodies and in strips like veins from 5 to 10 or more feet wide, traversing the rhyolite. Selecting the largest outcropping body, I had two shallow trenches, 80 ft. apart, dug down to rock in place, and sampled the better-looking strips. The west branch, 109 ft. long, cut 25 ft. of iron and apatite that carries 9.62% P_2O_5; then 20 ft. of apatite rock that carries 14.38% P_2O_5; then 25 ft. of apatite, quartz, and iron; then 30 ft. of fine-grained apatite rock with 15.70% P_2O_5; and finally 9 ft. of rhyolite. The east trench, 91 ft. long, cut 2 ft. of iron ore, then 11 ft. of apa-

tite rock that carries 13.28% P_2O_5, followed by 13 ft. of similar rock that contains 12.18% P_2O_5, and finally 40 ft. of rhyolite and iron ore.

In the west trench a width of 50 ft. averages about 15% phosphoric anhydride. This is much higher grade material than the average of all the apatite deposits in Canada that were mined a few years ago, but is only about half as rich as it should be to have commercial value (without concentration) in the western part of the United States. A sample that contained 12.8% phosphoric acid was submitted to George E. Colby, of Berkeley, California, who stated that such rock was not rich enough to treat with sulphuric acid for the commercial production of superphosphate. If about 8% of soluble phosphoric acid were produced by the treatment, the extraction and concentration could not be economically accomplished. The large amount of iron and alumina prevents its being satisfactorily treated with sulphuric acid to convert simple phosphate into superphosphate. The iron and alumina would so combine with the soluble phosphoric acid produced by the sulphuric acid treatment that it would render it insoluble. The iron and alumina should not run over 3% in the concentrated material. At present there is no economic necessity to search for a method of concentrating this deposit. Rock yielding 30% phosphoric anhydride has been shipped from southern Idaho and northern Utah to California, and higher-grade rock is brought across the Pacific Ocean from an island on the other side. The Idaho-Utah deposits of 30% grade are said to occur in seams and small bodies. An important manufacturer of superphosphate in California says that if such a large body of 15% phosphate rock as described in this paper exists in Nevada and can be concentrated to 30% material, it may become valuable. I estimated, on the basis of the outcrops, that the Amarilla group of claims might contain 500,000 tons of apatite-bearing rock that might range from 12 to 16% phosphoric anhydride.

These deposits have many of the characteristics of contact metamorphic deposits, but they occur in the igneous rock instead of in the older rock. Whence came so much iron and phosphorus? It is difficult to conceive that more than 850,000 tons of iron have been gathered from the apparently nearly barren rhyolites of the range. I believe that the iron and phosphorus may have been derived from the sandstone formation that underlies the iron-bearing rhyolite. This sandstone is highly ferruginous and probably also phosphatic. It was formed during middle Teritary time, a period favorable to the production of phosphatic lime elsewhere in the United States. The outcropping sandstone in the immediate vicinity of the Amarilla property is not leached; in fact, iron appears to have been added to the upper few feet of it. It seems probable that the rhyolite in a thick sheet flowed down the gently inclined surface of the sandstone, either in the lake or after the lake had been drained. It heated the water in the sandstone and perhaps to this was added hot water emanating from the lava. Thus the iron phosphate and silica could have been leached from the sandstone and would rise into the lower portion of the flowing lava to their present position. Some of the phosphate remained throughout the iron ore, but most of it was expelled (along with silica and some iron) and formed separate bodies and vein-like masses near the iron-ore masses. After the mass had become fairly solid, shrinkage cracks opened through it. The deeper portions of the iron orebodies were still expelling iron and silica in hot solution. These minerals rose in the fractures and were deposited as hematite-bearing quartz-veins in which are traces of gold and silver. Finally, in the last stage, the iron orebodies were slightly cracked and silica was deposited in the cracks, forming fine-grained quartz seams.

Bond in reinforced concrete beams has recently been investigated at the University of Wisconsin, and the results were reported and discussed in a paper read before the American Society for Testing Materials. The beams tested were in general 5 ft. 6 in. long, 5 in. wide, and 6 in. deep. They were so made that the central portion of the lower rod, the bond of which was to be obtained, was exposed. Two ⅜-in. round rods were placed above the exposed bar to distribute the tension-cracks and prevent failure in the concrete before the lower rod slipped. The embedment at each end was 10 inches in all but three instances. The conclusions arrived at from a study of the data obtained are as follows: 1. The bond of 1:2:4 concrete to embedded steel increases with age at least up to six months. About 80% of its six months' bond-strength is developed at 28 days. 2. Owing to the variation in results of the one-month tests, and the wide difference between laboratory experiments and practical working conditions, it does not seem as though the maximum bond of 1:2:4 concrete should be assumed greater than 200 or 250 lb. per square inch in designing. 3. The method of making bond tests by pulling a rod from a concrete cylinder, heretofore the usual method, gives results which are of neither quantitative nor qualitative value. A comparison between the bond developed in beams and that obtained in bond cylinders made at the same time shows that the cylinder tests gave bond stresses from 1.42 to 2.99 times as large as those obtained from the beam-tests. This indicates that the ratio of bond in cylinder to bond in beam increases with the compressive stress applied to the top of the bond cylinder. 4. The beam test for bond, on the other hand, approaches closely the actual conditions to which the bar and surrounding concrete are most often subjected, and gives values which are at least of qualitative value. Furthermore, values obtained by this method are in accord with the bond theory usually accepted as a basis in design.

Shasta heads the list of California counties in the production of silver during 1907, its output being more than 49% of the total.

Belt-driven power pumps are more efficient than steam pumps when a small amount of water is to be raised.

A CENTRAL COMPRESSED-AIR SCHEME.

*Ever since central power stations were first mooted on the Rand, far-seeing engineers have been debating the possibility of extending the principle of centralization to the costly and admittedly inefficient compressed-air plants. Today a scheme to establish central air-stations, which has been two years in the making, is on a fair way to be definitely realized. With its power-supply plans, the newest centralized electric power company proposes to include compressed air, the object being to relieve the mines from necessity to generate either form of power for themselves by the comparatively extravagant old-fashioned methods. What one power-supply company can do, no doubt the other companies can and will do also.

The engineering features of the new scheme are full of interest. In several particulars the world-renowned Paris compressed-air system will be followed in the design of the plant, but the Paris plant will be improved upon and advantage taken of the discoveries of modern practice and research. The Paris plant is driven by steam-power. The Rand plant will be driven by electric-power drawn from a central power-station. The compressors will be of the vertical displacement type of 5000 hp. capacity each, three-cylinder, two of low pressure, and one of high. Each compressor will have two 2500-hp. motors direct-connected to the crank-shaft. The motors will be coupled together, so that they can run at full or half-speed without altering the number of poles. Any variation in the output of air required below these two variations of speed will be dealt with by means of inlet-valves of the Corliss type, operating by trip-gear controlled from air-pressure. In view of the experiments now in progress on the mines to determine the utility of high air-pressure, the compressors will have a working pressure of from 80 to 110 lb. per sq. in., the pressure between these figures being dependent, of course, upon the requirements of the mines. The intention is to start with two chief stations on the Central Rand, one being situated in the Fordsburg neighborhood, the other at a point half-way to Germiston. Later, as other areas develop, additional stations will be established at central points. All these stations will be operated from a central electric-power station. In the light of recent investigations into the question of air-pipe dimensions, it is noteworthy that the pipes to be used on the proposed scheme will vary from 28 down to 11 in. diam. Joints will be electrically welded, without flanges, threaded socket-couplings, or expensive expansion joints. The air will be measured by meter at the mines, and the latter will pay by weight for the amount consumed, the power actually used only being charged for.

At one time it was considered more economical, owing to the saving in the outlay on pipes and the maintenance of a uniform pressure in the mine, to transmit the air at a high pressure of 200 lb. and upward to receivers at a sub-station capable of storing energy for a large number of drills for an hour, and then to reduce the pressure by means of reducing-valves before entering the service-pipes to the mines, to the usual working pressure. This method has, in the light of recent practice, been rejected.

With pipes of proper size and in good condition, air may be transmitted, say, ten miles, with a loss of pressure of less than one pound per mile. If the air were at 80 lb. gauge or 95 lb. absolute upon entering the pipe, and 70 lb. gauge or 85 lb. absolute at the other end, there would be a loss of little more than 10% in absolute pressure, but at the same time there would be an increase of volume of 11% to compensate for this loss of pressure, and the loss of available power would be less than 3%. With higher pressure, still more favorable results could be shown. As a competitor with electricity in long-distance transmission, it seems almost like heresy to claim equal if not greater efficiency; nevertheless it is claimed that within the 20-mile limit compressed air will compare in efficiency with electric transmission, while so far as operating and maintenance expenses are concerned, an electric proposition is not to be compared for a moment with that of air. Over 15,000 hp. of compressed-air is distributed today throughout the city of Paris, being transmitted for a series of stations from three to fifteen miles distant, with a loss of 10-lb. pressure in transmission. An essential requisite of a successful central air-compressor scheme is cheap electric power. The guarantee of this in the case of the Rand assures the commercial success of the project.

*Abstracted from *South African Mining Journal.*

The National Forests are constantly patrolled by a picked force of rangers and guards. The present summer force of such rangers and guards, whose main duty is fire patrol, is 1351 men; the average area that each is required to protect is 121,506 acres. This area is altogether too large, and as soon as funds are available to permit of the employment of a larger force of men the area per man will be reduced. In order to provide rapid means of travel between the various parts of the National Forests, and to facilitate the massing of large forces of men to fight fire, as well as to furnish vantage points from which the fires may be fought successfully, 160 miles of road and 3300 miles of trail were built during the last fiscal year. In several cases fire-breaks from 16 to 100 ft. wide have been constructed, from which all timber and inflammable material was removed. Several miles of such fire-breaks now exist on the National Forests in southern California, where it is especially important that the forest-cover on the watersheds of important irrigation streams be protected. Telephone lines have been constructed connecting ranger stations with the headquarters of the forest, in order that fires may be reported and promptly extinguished. During the fiscal year ending June 30, 1908, 3500 miles of telephone line were strung in the National Forests.

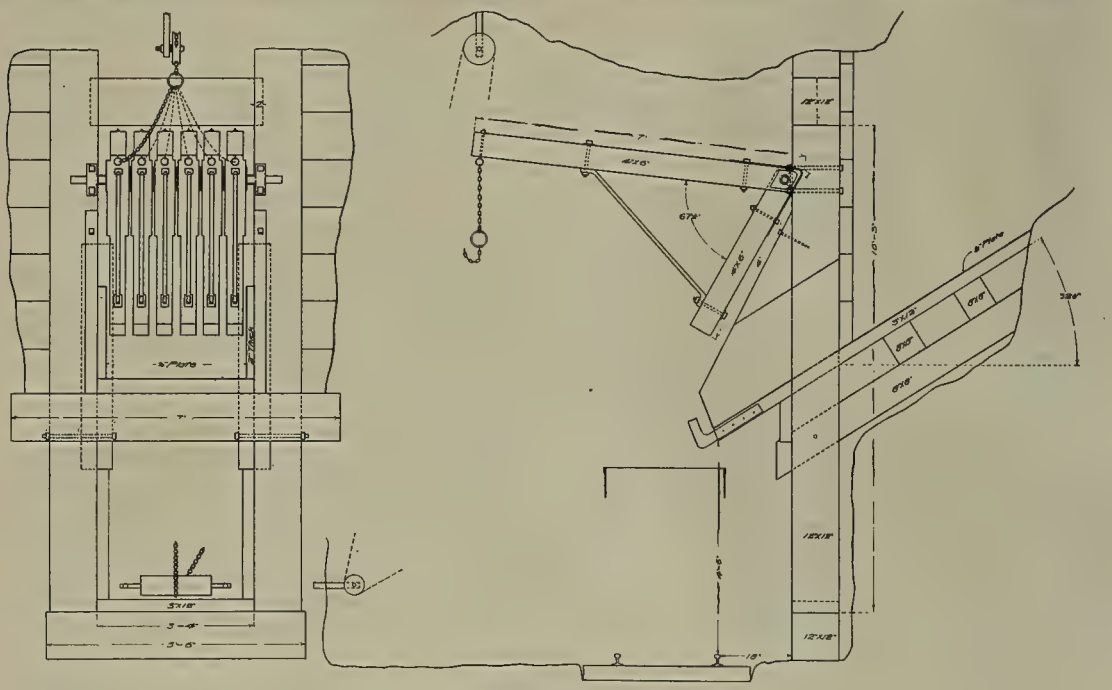
Californite is a compact variety of vesuvianite with color and texture so like jade that it was at first mistaken for that mineral. It is found in Siskiyou county, Cal., on the south fork of Indian creek, 12 miles from Happy Camp.

THE FINGER-CHUTE.

Written for the Mining and Scientific Press
By T. A. Rickard.

In mines producing a large tonnage of low-grade ore, the handling of the material broken in the stopes becomes a problem of prime importance. From the stope itself the ore has to be transferred to the cars on the main levels. This transfer is effected by gravity wherever the conditions are favorable; where the dip of the lode is so flat as to render automatic descent impracticable, the assistance of an elastic traction system, such as the 'mono-rail' at Johannesburg or the 'go-devil' at Grass Valley, is invoked.

The methods in vogue in the great mines at Treadwell, on Douglas island, Alaska, have many features worthy of record and of imitation. The pillar system of excavation was described in the issue of July 18 of this journal. Another detail in the local practice as developed by the management is the use of the 'finger-chute,' a device for expediting the descent of the ore into the cars.



The Finger-Chute.

The finger-chute was first used, as far as I can learn, in the El Callao mine, Venezuela, and was brought to the Alaska-Treadwell by Mr. H. C. Perkins, probably. Wherever originated, this device has been brought to perfection by the successive superintendents of the Alaska-Treadwell mine, and it has become a distinctive feature of their underground operations. The finger-chute is designed to serve stopes yielding ore that is broken in large pieces of irregular shape. As used several years ago it was described by Mr. Robert A. Kinzie in the Transactions of the American Institute of Mining Engineers, Vol. XXXIV, under date of 1904. But changes have been made since then, by Mr. McKinzie and his assistants, with a view to diminishing the wear and tear, thereby lessening the cost of maintenance; also one or two minor, but important, modifications have been made in the details of the mechanism. A drawing is given herewith, and a good photograph taken by flashlight underground.

Instead of having the ordinary solid door, whether of iron or wood, the chute is closed by means of six 'fingers,' made of 4 by 6 inch timbers, faced with iron. These fingers can be operated independently, one at a time or all together, so that if a piece of ore chokes the outlet, it is easy to look between the fingers and see what is causing the obstruction. Thereupon, such of the fingers can be lifted as will permit a man to use a crow-bar with advantage; meanwhile, the other fingers will prevent a sudden rush of rock. In case the manipulation of a bar proves ineffectual, it is customary to resort to blasting, either by 'bulldozing' (placing dynamite cartridges on a rock without drilling a hole) or by actually drilling a hole for the insertion of dynamite. The salient feature of the arrangement is the ease of access. The fingers are kept in place by the weight of the longer arm; when released, after being raised, the fingers fall, blocking the chute. Of course, this kind of chute is expensive (as will be explained in the sequel), but in a mine producing each day 3000 tons of ore, much of which is in the form of irregular pieces of large size, it is economical to build a comparatively expensive chute if it will facilitate the handling of a low-grade product from the stopes.

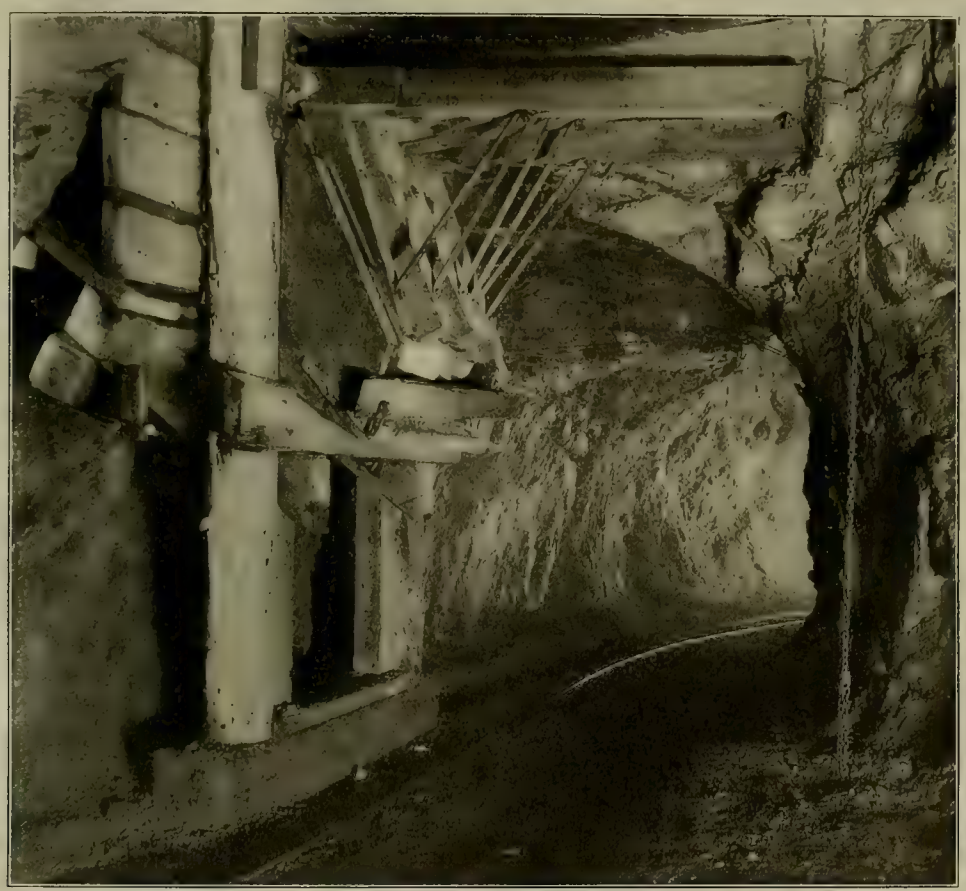
The finger-chute is built so as to withstand rough usage. The fingers themselves are protected by sheet iron (⅜ in. thick and 4 in. wide) on the face opposed to the descending ore. Each finger is made of two pieces of 4 by 6 in. timber, set at an angle of 67½ degrees; the shorter arm (in service) is 4 ft. long, while the longer, which acts as a lever, is 7 ft.

long. See accompanying drawing. The fingers are bolted and braced so as to make a strong construction, and the parts exposed to wear are armored with thick sheet-iron. In the knuckle of the finger there is a hole (1½ in. diam.) through which passes an iron pipe, serving as an axle, on which the fingers can be moved up and down. To the extreme end of the long and (when at rest) nearly horizontal arm of the finger, a chain (⅜ in. iron) is attached, the other end being fastened to a ring. This ring holds the chains from all the fingers. From the ring a chain passes over a sheave (8 in. diam.) down to a windlass on the side (and 2 ft. from the bottom) of the level opposite the chute. On the deepest levels of the Alaska-Treadwell mine this windlass is not used at present, but experience indicates that it will be needed as the stopes become enlarged. By means of the windlass and sheave, one man can readily raise all of the fingers. An individual finger is moved by pulling a single chain or, more usually, a bar is pushed against the lower end, so as to elevate it, when desired.

The frame of the chute itself is made of heavy timbers, 12 by 12 in., drift-bolted together and blocked solidly against the adjacent rock. Special care is taken to put these timbers firmly in place, so that they will be able to withstand the blasting often necessary to clear an obstruction in the chute due to jamming of the descending ore. The lip of the chute is built of 3-in. plank, the sides having an extra cover of 2-in. plank. Both sides and bottom are protected by ¼-in. iron plate.

In constructing one of these finger-chutes, the first thing done is to erect the front frame of 12-in. timbers; these are set in hitches cut in the rock and solidly blocked. Then the cross-timbers, which serve as bearers for the sides and bottom of the chute, are placed in position. These also are firmly blocked and wedged against the sides of the opening in the rock. Next, the side and bottom planks are 'spiked' or nailed in place. Brackets are bolted to the front timbers, in order to carry the pipe on which the fingers turn. This pipe is passed through the six fingers and then they are lifted into position. A hole 18 in. deep is drilled in the roof of the level to receive a piece of 1½-in. round iron, made tight by inserting pieces of wood or a wooden plug, and then driving the iron into place with a heavy sledge-hammer. The iron is pointed and the head of it is pierced with an inch hole, so as to receive a short bolt, on one end of which the sheave will turn. This bolt is held firmly in position by a nut opposed to a shoulder. The sheave is kept in place by a cotter pin that passes through the bolt.

The original opening in the raise is usually irregular in shape and the front frame of the chute is of standard size; thus there is a variable amount of space between the timbers and the rock. This must



The Finger-Chute in the Alaska-Treadwell Mine.

be closed tightly by means of wooden blocks, firmly wedged. The windlass consists of a wooden roller, the axle of which is a piece of 1⅛-in. round iron, one end being extended and bent so as to form a crank-handle. The shaft of the windlass is supported and turned through round openings made in the projecting ends of two pieces of 1½-in. iron inserted firmly within two horizontal drill-holes made in the side of the level, as in the case of the sheave. In order to stop the flow of fine material escaping between the fingers, a 6-in. board is dropped in front of the lip of the chute. This board is held in place by an angle-plate nailed to the bottom lining of the lip on both sides.

Two men, at $4 and $3.50 per shift, respectively, will erect a finger-chute in three shifts. All the material used in the construction is framed, ironed, and made ready at the surface. An ordinary board-chute requires the labor (in erection) of two men for two shifts, when round timbers are used. Formerly, a roller was used in place of the sheave. The roller required two bearings and was more expensive to install, yet it did not last as long nor work as easily as the sheave. The rope formerly used has been replaced by a chain, which lasts sufficiently longer to be cheaper. The tie-rod holding the posts against the head-block has been eliminated, in favor of wooden wedges at the side.

It is possible to draw 500 tons per shift from a single finger-chute. The cost of the chute as formerly constructed was $123; as now modified and above described the expense is only $78. This includes the cutting of the station, but not the excavating of the raise. It is proper to state that this device is suitable only where the ground is dry and the ore coarse; even at Treadwell it has been found inexpedient to use the finger-chute in the Ready Bullion and Mexican mines, which are neighbors of the Alaska-Treadwell and under the same management; in these two mines the ordinary board-chute is found satisfactory. The finger-chute is eminently a chute that will hold the large and small stuff concurrently or separately, as desired.

Iron has a strong affinity for oxygen, which increases with the temperature to which the former is raised, and the specific heats of the resulting oxides are much higher than that of the metal itself. Therefore, in experiments for the purpose of accurately determining the specific heat of iron, it is necessary to prevent oxidation by the removal of the air in contact with the heated sample under test. This has been accomplished by P. Oberhoffer, in the metallurgical laboratory of the Aachen Technical School, who has described the apparatus used and given the values derived thereby in a recent issue of the *Zeitschrift des Vereines Deutscher Ingenieure*, which is abstracted as follows by *The Engineering Digest*. Dr. Oberhoffer employed a modification of Bunsen's ice calorimeter, the test tube of which was connected with a vacuum pump. The iron sample was heated directly above the calorimeter by means of a small Heraeus electric furnace, and then allowed to drop down into the calorimeter tube, which was immediately closed by means of a valve. During the cooling of the sample the pump maintained a vacuum in the calorimeter tube, thus preventing oxidation. As an outcome of these experiments, in which all precautions, such as accuracy in the measurements of temperature, uniformity of heating, and insulation of the calorimeter from external influences, were carefully taken, the following results were obtained:

MEAN SPECIFIC HEAT OF IRON AT VARIOUS TEMPERATURES.

Temp., F.	Sp. ht.	Temp., F.	Sp. ht.	Temp., F.	Sp. ht.
500	0.1228	1300	0.1601	2100	0.1667
600	0.1226	1400	0.1680	2200	0.1667
700	0.1294	1500	0.1698	2300	0.1666
800	0.1324	1600	0.1699	2400	0.1662
900	0.1357	1700	0.1693	2500	0.1663
1000	0.1388	1800	0.1682	2600	0.1665
1100	0.1414	1900	0.1672	2700	0.1666
1200	0.1462	2000	0.1665	....	.....

If the values in this table are plotted as ordinates at abscissas of their corresponding temperatures, a cooling curve results, in which a sharply defined change of direction (vertically) is noted at about 1200°F., corresponding to the critical point Ar 1. This direction is maintained in general to Ar 2, at about 1350°F., when it changes gradually to a horizontal one, the transition being completed at about 1650°F. The specific heat of alpha iron (magnetic, below Ar 2) therefore increases directly with the temperature (approximately), while gamma iron (above Ar 3, non-magnetic) remains practically constant. Regarding beta iron (between Ar 2 and Ar 3), it may be said that, according to Richarz's law, that condition of a substance has the highest specific heat whose specific weight is least. To the minimum specific weight corresponds the maximum specific volume, and consequently the greatest coefficient of expansion. Of the three forms, beta iron has the highest specific heat. The iron used in these experiments was almost entirely pure, having the following composition; the test samples weighed from 1 to 6 grams:

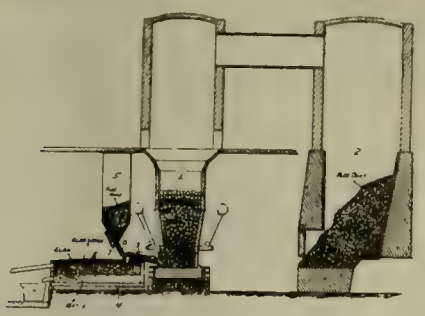
Constituent.	Per cent.
Carbon	0.060
Silicon	0.005
Phosphorus	0.005
Sulphur	0.019
Manganese	0.050
Iron	99.861
Total	100.000

A new plan for storing gasoline or petrol depends upon the fire-stopping property of wire gauze that gives safety to the Davy mining lamp. A gauze tube is inserted in the opening of the can or tank, extending to the bottom, and the orifice is then sealed by a plug held in place by fusible solder. If fire occurs near or around the tank, the solder melts and the plug is blown out, when the vapor escaping through the gauze tube burns quietly without explosion. In a test of the method, 12 out of 17 ordinary cans filled with volatile oil exploded on contact with fire, throwing the burning liquid in every direction, but 12 cans fitted with the safety device failed to explode, and the liquid burned quietly and harmlessly.

MINING AND METALLURGICAL PATENTS.

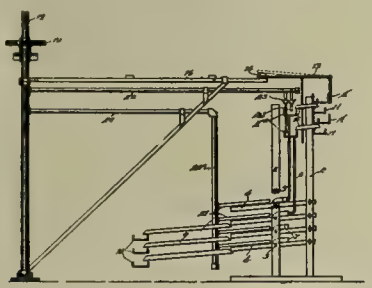
Specially reported for the MINING AND SCIENTIFIC PRESS.

SMELTING.—No. 897,993. Alexander R. McKenzie, Great Falls, Montana.



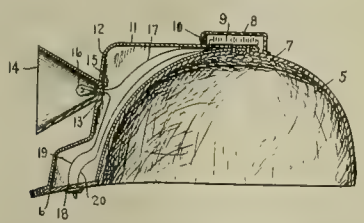
The herein described smelting process, consisting in discharging slag and matte from a furnace to a settler, and discharging fine ore into the stream of slag and matte as the same flows from the furnace to the settler.

CONCENTRATING APPARATUS.—No. 898,331. Wilton E. Darrow, Sutter Creek, California.



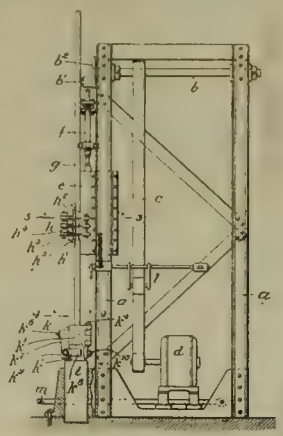
In a concentrating apparatus, a plurality of superposed annular series of stationary tables having collecting surfaces, stationary annular pulp boxes and means to distribute pulp therefrom to the tables, supports upon which the tables rest with their ends extending radially inward beyond the supports, and a centrally journaled water supply with distributing arms extending outwardly over the tables and contiguous to the supports.

MINER'S CAP AND LAMP.—No. 897,588. Lewis W. Cogswell and James D. Abel, Taylorville, Illinois.

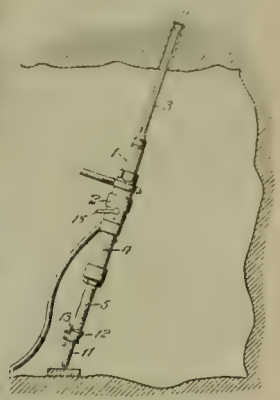


A miner's cap having a vizor, in combination with a pad secured to the inner crown of the cap, a sheet-metal casing having a bottom portion conforming to the shape of the cap and ending at the upper crown of the cap and then being doubled upon itself to form a base of double thickness, the upper portion of the casing being bent outward and downward, and secured to the vizor of the cap, the forward vertical portion of said casing having a threaded opening, a frusto-conical reflector within said opening, a lamp carried by said reflector, a fabric pocket having a flap secured to the outer crown of said cap inclosing said base, a battery upon said base and within said pocket, an electric switch secured to the under surface of said vizor, and electric conductors connecting said switch, lamp, and batteries.

MACHINE FOR SHARPENING ROCK-DRILLS.—No. 898,663. Bradford H. Locke, New York.



No. 898,663.



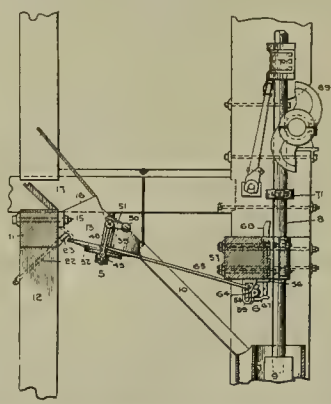
No. 898,702.

A die for sharpening drills and adapted to be secured to the drill head, the same comprising a head block, die members pivotally mounted thereon and adapted to embrace the drill head, and a clamping device carried by the head block and engaging the die members to hold them securely about the drill head.

HAMMER-DRILL.—No. 898,702. Albert H. Taylor, Easton, Pennsylvania.

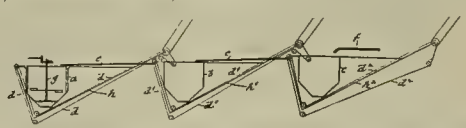
A pneumatic tool, an air pressure feeding device therefor, and an adjustable extension secured to said device, forming an end support for the tool.

ORE-FEEDER.—No. 899,527. Samuel T. Graham, Los Angeles, California.



An ore-feeder comprising a stationary hopper, a shaft passing through the centre of said hopper, a disk on the shaft below the hopper and covering the lower end thereof, said disk having a concentric friction edge, an arm pivoted on the shaft below the disk and extending beyond the disk, a friction block in engagement with the friction edge in advance of the arm, a rigid member pivotally connecting said block with the arm, and means for oscillating the arm.

SLIMES-SEPARATOR.—No. 899,428. Horace G. Nichols, Ymir, British Columbia, Canada.



In a slimes separator, the combination of a tank for the cyanide solution, a settler within said tank, an endless conveyor belt within said tank, upon which the slimes are deposited from said settler, said conveyor belt being movable in upward direction, and means for washing the slimes carried off by said belt.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

MINING—OBSTRUCTING A STREAM WITH TAILING.

A person engaged in mining may deposit tailing in a natural watercourse to a reasonable extent, but he has no right to make such deposit to the extent of diverting the water from the natural channel and causing it to overflow the lands of a lower owner, to his damage.

Salstrom *v.* Orleans Bar Gold Mining Co., (Cal.) 96 Pac. 292, May, '08.

CONFLICTING MINING LOCATIONS—EVIDENCE.

A third locator of a lode mining claim may introduce evidence which tends to establish the existence of a valid and subsisting location prior to the location which such third locator is adversing.

Farrell *v.* Lockhart, 28 Sup. Ct. 681, March, '08.

MINING CLAIM—CONVEYANCE OF PART—EFFECT.

A conveyance of a definite and designated tract of a mining claim owned by tenants in common, giving the grantee the same rights as the grantors had, severs completely such tract conveyed, and the grantors have no interest in a discovery made thereafter by the grantee.

Merced Oil Mining Co. *v.* Patterson, (Cal.) 96 Pac. 90, May, '08.

MINING—ADVANCES BY STOCKHOLDERS.

Where, in the absence of funds of the corporation, certain stockholders tacitly agreed to, and did, advance funds with which to continue mining operations, this was held not to constitute them a mining partnership, and did not make them personally liable for the debts of the corporation, but were no more than advances to the corporation.

Dodge *v.* Chambers, (Colo.) 96 Pac. 178, June, '08.

ADVERSE SUITS—EFFECT OF NON-SUIT.

Where a plaintiff in an adverse suit to establish title to a disputed claim fails to establish his claim, he is properly non-suited, and he has no right thereafter to participate in the proceedings. After such a non-suit the hearing thereafter is *ex parte* as to the defendant, and the presumption is that all proceedings were regular and the judgment for defendant correct.

Lozar *v.* Neill, (Mont.) 96 Pac. 343, June, '08.

MINING CLAIM—DISCOVERY—PRIORITY.

One person located and staked a placer claim on May 25, but made no discovery at the time; and thereafter left to get supplies and necessary equipment to proceed with the development work. In the meantime another person located and staked the claim, and when the first locator returned, on June 9, he found the second locator in possession. The first locator entered peaceably on June 9, built a cabin and proceeded to sink a shaft. During the same time the second locator remained on the claim, living in a tent, and was engaged likewise in sinking a shaft. The first locator found sufficient gold in the shaft sunk by him to warrant him in the further expenditure of time and money in the development of the claim. The location made by the first locator on May 25, unaccompanied by discovery at the time, gave to him no right subsequently to return and take possession of the claim after the second locator had made due location and taken possession for the purpose of exploration. But both locators being in possession by common consent on and after June 8, it became a race of diligence between them to discover gold, and he who first discovered it obtained the prior right. While his discovery did not relate back to the date of his location, yet his location was made valid by discovery and became effective from that date, and gave him the full right to the claim, to the exclusion of all others.

Johanson *v.* White, 160 Fed. 901, Feb., '08.

Publications Received.

GENESIS OF METALLIFEROUS ORES AND THE ROCKS WHICH ENCLOSE THEM. By Brenton Symons. Published by *The Mining Journal*, London. 8vo., 495 pp., Ill. Price $2.50.

The author states in his preface that his purpose is to furnish "a popularly written book, as terse and devoid of technical expressions as the nature of the subject will admit," and he proceeds to carry out his intention with modesty and success. Little bits of poetry and occasional poetic touches in the prose lighten even such technical references as are necessary. The illustrations are numerous and good. Even the layman will find himself attracted by the suggestive drawings of things below the surface of the earth. Many of these refer to the classic mining regions of Cornwall and Saxony, so that the American reader will find himself becoming informed concerning localities outside his ken, although American sources of information are in no way neglected. The scope of the volume is indicated by the headings: Genesis of rocks, mountain making, denudation of mountains, sedimentation of strata and ores, metamorphism of strata, formation of ore deposits.

PRINCIPALS AND PRACTICE OF SURVEYING, Vol. II. Higher Surveying. By Breed & Hosmer. 8vo., 430 pp., Ill. New York. John Wiley & Sons. 1908. Price $2.50 net. For sale by the MINING AND SCIENTIFIC PRESS.

This second volume of an admirable text-book on surveying deals chiefly with the several approved methods of conducting topographic and hydrographic surveys. The book is divided into four parts, the titles of which indicate the character of the subject-matter treated. They are: 'Control of the Survey,' 'Filling in Topographic Details,' 'Hydrographic Surveying and Stream Gauging,' and 'Constructing and Finishing Maps.' The volume is replete with practical hints, sample notes, and illuminating illustrations, notable among which are the examples of topographic drawing properly and improperly executed. The chapter on photographic surveying is particularly instructive. This and Vol. I should fill a long felt want for a practical text-book on surveying.

COMMERCE AND NAVIGATION OF THE UNITED STATES. Annual report of the Bureau of Statistics of the Department of Commerce and Labor, for the year ending June 30, 1907.

THE GEOLOGY AND ORE DEPOSITS OF THE COEUR D'ALENE DISTRICT, IDAHO. By F. L. Ransome and F. C. Calkins. Professional Paper No. 62 of the U. S. Geological Survey.

Commercial Paragraphs.

THE BUCYRUS CO., South Milwaukee, has recently opened an office at 50 Church street, New York City.

THE ASBESTOS MANUFACTURING & SUPPLY CO. announces the removal of its San Francisco sales office to 15 Fremont street. The factory and warehouse is still at 63 Minna street.

El Noticiero is the title of a new monthly publication in San Francisco, devoted to the expansion of trade relations with Mexico. It is handsomely printed, in English and Spanish, and begins with the presentation of much valuable data, including new projects of Mexican law for the fostering of commerce. It is published by W. D. Coffey, at 330 Jackson street.

Catalogues Received.

THE HILL CLUTCH CO., Cleveland, has recently issued a reprint of that part of its catalogue F which describes collar oil bearings.

THE REVERE RUBBER CO., Boston, has issued a new catalogue of 63 pages illustrating its line of packings, including some new ones recently put on the market. There is much valuable information contained in the pamphlet, which has evidently been prepared at a great expense. The Company will mail a copy to anyone interested.

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EDITORIAL.

TIERRA DEL FUEGO is one of the regions where the dredge has been applied to gold mining. Our London correspondent refers to the meeting of an English company engaged in this kind of digging. Instead of moss on the surface of the ground, they have peat; and this peat is used for fuel.

DREDGING AT OROVILLE has been the subject of proceedings in the Circuit Court. The City of Oroville brought suit against the Indiana Gold Dredging Company, claiming that the channel of the Feather river was being blocked by tailing so as to menace the safety of the people in the valley. The judge modified the injunction granted by the Superior Court so that dredging can proceed under reasonable restrictions.

ANNOUNCEMENT is made that the steamship service between San Francisco and New Zealand is to be resumed in January next. The terminal port will be Wellington, instead of Auckland, and a call will be made at Tahiti, instead of Honolulu. The Union Steamship Company of New Zealand and the Oceanic Steamship Company of San Francisco will co-operate in establishing this new intercontinental service. From Wellington there is an excellent service to the chief ports of Australia.

IN OUR NEWS COLUMNS a mention is made of the big ditch built by the Yukon Gold Company, at Dawson. This is the most important engineering enterprise undertaken close to the Arctic Circle, and the completion of it marks an important point in the industrial development of the Yukon Territory. The ditch is 70 miles long, and will bring 5000 miner's inches of water to the placer deposits on Bonanza creek, enabling the engineers of the Yukon company to exploit the large banks of gravel known locally as the White Channel, a bench deposit that was worked on a small scale in the early days, and from which many fortunes were won. We shall publish a detailed description of this undertaking at an early date.

ON OCTOBER 22 the last steamboat leaves Nome for the 'outside,' meaning thereby the homeplaces of the men who go north in search for gold. On that date this year the *Northwestern* will take a full complement of mine operators, engineers, and laborers. Other steamships that preceded will have been crowded, but this, 'the last boat,' will be loaded with passengers whose labors for the season are finished. From then until the middle of June next year Nome will have no communication with the 'outside' world except by means of dog-sleds and horse-stages running over the ice and snow by way of St. Michael, Kaltag, Gibbon, Fairbanks, and

Valdez, where steamship connection is made with Seattle and San Francisco.

FROM BUTTE our correspondent writes concerning the organization of an association intended to oppose fraudulent mining schemes. Each member of this new association is required to "pledge his honor as a man that he will so conduct himself in relation to the business of mining as not to reflect unfavorably" upon that basic industry. Legislative enactments by the Assembly of Montana are to be demanded in furtherance of the program to scotch wild-cats. All of this is commendable and, whether it succeeds to the full extent expected, or not, the effect of such co-operation between mining men is to create a healthy public opinion, without which laws and juries are impotent.

WHATEVER may be thought of the proposal to transfer the ownership of the railroads to the Government, and however people may disagree as to the balance of evil between national and corporate management, there can be no doubt that we are trending toward a parting of the ways. Mr. E. H. Harriman and his associates have recently obtained control over the 6300 miles of the St. Louis & San Francisco railway. This group of capitalists and stock-jobbers now has a dominant voice in the management of 11 railroad systems, aggregating 81,544 miles. In 1880 Jay Gould individually controlled all except two of the transcontinental railroads, and being an unscrupulous gambler, his control ended in disaster for the companies and their shareholders. To some people Harriman is a railroad genius and a practical administrator; to others he is only a stock-jobber and a financial trickster on a large scale. He wrecked the Alton and he gambled with the funds of the Union Pacific; he used his position to aid the schemes of a coterie, and he played with the credit of a great railroad in order to manipulate the stock market. No argument that any socialist orator can bring to the support of government ownership of railroads will be one-half as forceful as the spectacle of a national system of transport controlled by a tricky individual. Mr. Harriman is riding for a fall; the faster he succeeds in his efforts to control competing railroads, the sooner will it become obvious that Federal management is less objectionable than dependence upon a group of predatory promoters, who disregard the fundamental fact that railroad ownership is a trusteeship.

IN THE LAST NUMBER of *Economic Geology* appears a vigorous protest, by Mr. T. A. Jaggar, against a supposedly hypercritical attack made by Mr. F. L. Ransome on a recent article by Mr. J. E. Spurr. We published the article that furnished the text for this tripartite controversy, but we do not care to discuss the merits or demerits of Mr. Spurr's contribution. The fact that we published it suffices to express our opinion as to the usefulness of publication. But we venture to risk further trouble by stating our agreement with a good deal that Mr. Jaggar says. He protests against a hypercritical and intolerant attitude on the part of some members of the Geological Survey at Washington; he even hurls "dogmatic officialism" at their heads. And not without some justification. Many a Survey publication is disfigured with notes embodying points of minor disagreement with other writers, and many pages are lacking in cordial acknowledgement to earlier observers whose labor broke the trail for the gentlemen of the Department of the Interior. There is an impression that the geologists of the Survey are profuse in references to the writings of their confréres, while deeming the work of outsiders, such as professors of geology and mining engineers, as unsuitable for mention. There are geologists outside of the Survey; and this is said with the hope of not giving offence. We criticize as a friend.

Deep Leads.

THE ARTICLE on the 'deep leads' of Australia will be interesting to many of our readers, for the operation described has some points of resemblance to deep-lead mining on the Forest Hill divide in California and also to drift-mining in Alaska and the Yukon. In the deep valleys of the Yuba and American rivers, it is possible to follow the buried channels under the cover of lava by means of workings that conform to the bed-rock of a prehistoric stream. Shaft-sinking is unusual, save for ventilation. But near Ballarat, in the Australian State of Victoria, it is necessary to reach the layers of gold-bearing gravel by means of a shaft. It is true the deep leads first discovered were mined as shallow placers until they were traced under cover of the basalt that crowned the river-bank, but these first operations led to the recognition of the fact that the alluvium lay on a bed-rock of basalt, not unlike the cap, and that underneath that second bed of Tertiary basalt there existed another gravel-channel lying upon the basement rock, namely, sandstone and slate of Lower Silurian age. More remarkable still, in the true bedrock of the deep leads were found the croppings of the quartz veins from which by erosion in past time the gold of the gravel had been derived. Thus the Band & Albion mine yielded 519,551 ounces of gold, or $10,000,000, from the deep leads up to 1879, when the richness of the veins in the bedrock became recognized. The shaft was sunk to 1500 ft. and from the quartz, by stamp-milling, no less than $3,000,000 was extracted up to 1888. This was one of the few cases where a vein-deposit was topped by an alluvial deposit, both rich. Another analogy can be made with the drift-mines of Alaska and the Yukon. The gold-bearing alluvium of a deep lead is blanketed by a flow of lava, the product of heat; the gravel of the North is covered under frozen ground, due to frost; in each case the overlying hard layer serves as a roof under which the patient miner digs for the gold concentrated long ago in an extinct river-bed. As regards the metallurgical treatment of the gold-bearing material, it is noteworthy that the Australian miner subjects his gravel to a washing process in a 'puddling' machine, which detaches the clay and loosens the gold imbedded therein. The machine is

an agitator, facilitating disintegration of gravel held together by clay. In the deep-lead mines of California the gravel is accumulated and is then crushed coarsely through a stamp-mill, or broken in revolving bar disintegrators, or washed with a jet into a series of sluice-boxes. In Alaska the gravel, thawed underground by steam or even by wood fires, is hoisted to the surface and discharged into water running over the riffles in successive sluice-boxes. In each case extraction of the gold is easy.

While the exploitation of the deep leads in Victoria has proved a serious disappointment, it is not without hope. The chief difficulty has been the tremendous volume of water that it has been found necessary to pump. The various companies in the Lodden valley have spent fully $7,500,000 in preparatory work without as yet extracting any gold worth mentioning. The Lodden Valley company itself has been pumping from eight to ten million gallons per day for several years without exhausting the reservoir accumulated in the old river channel, which is 800 to 1200 ft. wide. It is pleasant to record that the Government of Victoria has advanced $40,000 to this company to aid work that is deemed of public importance.

A Timely Decision.

A DECISION of more than passing importance has been recently rendered by the Supreme Court of the United States (Farrell *v.* Lockhart, 28 Supreme Ct. Rep., 681). The case of Levagnino *v.* Uhlig, 198 U. S., 443, decided in 1905, has probably done more to unsettle the established ideas of mining law and has provoked more unfavorable comment than any other decision rendered by the 'highest court in the land' on the subject of mining law. In our issues of February 16, June 1 and 15, 1907, the Lavagnino decision was discussed at some length. Prior to the Lavagnino decision, the law was generally understood to be that a re-location on lands actually covered at the time by another valid subsisting location is void. Such lands are not open to location until they have been abandoned or forfeited. It was generally conceded that the Lavagnino case held, in contravention of the then well settled law on the subject, that the forfeiture or abandonment of a senior location would inure to the benefit of a junior claim that was located so as to include a portion of the existing senior location. Many courts refused to follow the rule laid down in the Lavagnino case, either limiting the application of the rule, or contending that the more recent case of Brown *v.* Gurney, (210 U. S., 184), silently overruled the former case. The Supreme Court of Nevada, in the case of Nash *v.* McNamara, (93 Pac., 405), refused to be bound by the broad rule laid down in the Lavagnino case, and after an exhaustive review of the authorities, held that the decisions opposed to that doctrine were too numerous to permit of "a result so revolutionary."

Now comes the Farrell *v.* Lockhart decision above referred to, written by Justice White, who also wrote the Lavagnino opinion, and clears up the atmosphere. The facts of this case are as follows:

The South-Mountain lode mining claim was located in August 1900. On August 1, 1901, and before the South-Mountain claim would have been forfeited by failure to perform the required annual labor, other parties located the Cliff claim, which was practically co-extensive with the South-Mountain ground. The South-Mountain owners failed to do their assessment work and, on January 2, 1903, the Divide location was made by still a third party and covered substantially the same ground. The Supreme Court of Utah (86 Pac., 1077) held that the Divide locator was entitled to the ground inasmuch as the ground was not open to location when it was included in the Cliff location, by reason of the existence of the South-Mountain location.

The United States Supreme Court, in commenting on the Lavagnino *v.* Uhlig opinion, says:

". . . whatever may be the inherent cogency of that reasoning, in view of the experience of the courts referred to concerning the practice which it was declared had prevailed, in reliance upon what was deemed to be the result of previous decisions of this court, and the effect on vested rights which it was said would arise from a change of such practice and taking into view the prior decisions referred to, especially Belk *v.* Meagher, (104 U. S., 279), and also the more recent case of Brown *v.* Gurney, (201 U. S., 184), we think the opinion in the Lavagnino case should be qualified so as not to exclude the right of a subsequent locator on an adverse claim to test the lawfulness of a prior location of the same mining ground upon the contention that, at the time such prior location was made, the ground embraced therein was covered by a valid and subsisting mining claim. . . ."

It is fortunate that the law on this subject is again settled and the Lavagnino doctrine relegated to history. A prospector who invades the boundaries of a prior, valid, and subsisting claim, acquires no rights whatever—present, potential, or eventual. If he wishes to re-locate ground, he must wait until the prior locator abandons it or is clearly in default in the performance of the work required by law to be done.

Bennett H. Brough.

FROM LONDON we learn of the death of Bennett H. Brough, secretary of the Iron and Steel Institute. As the author of a standard text-book on mine surveying he was known to students all over the world, and as a kindly, capable, and honorable man he will be regretted by members of his profession on both sides of the Atlantic. He was a graduate from the Royal School of Mines, where he served as instructor for seven years. As juror at several international expositions he did conscientious service. He also wrote many technical papers of more than usual interest. But all these are secondary to the actual character of the man and his influence for good as an individual. Many a man in the desert, in the jungle, and in the mountains, where mining is being done, will find his day overcast when he hears that Bennett Brough has crossed the range.

Personal.

S. F. Emmons is at Salt Lake.

Gelasio Caetani is in Arizona.

Arthur S. Dwight is at Salida, Colorado.

Fred S. Siebert is at Georgetown, California.

H. Kilburn Scott is examining mines in Greece.

Udo Hesse has returned from Alaska, to Seattle.

C. F. Nourse has returned from Russia to San Francisco.

Hiram W. Hixon has returned to Philadelphia, from Ontario, Canada.

Richard A. Parker has moved his office to 404 Colorado Bdg., Denver.

W. D. Pearce is manager for the Hill Syndicate, at Las Vegas, Nevada.

C. Henry Thompson has returned to Los Angeles, from Durango, Mexico.

Arnold Becker was in San Francisco this week; he is now in Kern county.

Henry F. Lefevre has been examining some properties near Murray, Idaho.

Douglas Waterman has been examining dredging ground in northern California.

Walter Fitch has resigned as superintendent of the Calumet & Hecla mine.

H. Oren Cummins has opened an office as consulting engineer at Redding, California.

Robert Stevenson, of New York, has completed a careful intestigation of the Rawhide district, Nevada.

S. L. Speak recently made an important report on the Great Boulder Perseverance mine, at Kalgoorlie.

Howard T. Walsh, Pacific Coast manager for the Sullivan Machinery Co., returned this week from Chicago.

Etienne Ritter has been appointed consulting engineer to the Burleigh Mining Co., of Silver Plume, Colorado.

Waldemar Lindgren has accepted an invitation to lecture on geology at the Massachusetts Institute of Technology, Boston.

Forbes Rickard has completed an examination of the Saratoga mine, in Gilpin county, and has now left for Cripple Creek, Colorado.

W. Fleet Robertson, Provincial Mineralogist for British Columbia, has returned to Victoria from the new placer district on the Findlay river.

John Herman, formerly with the Cananea Consolidated Copper Co. in Sonora, has opened an assay office and chemical laboratory at Los Angeles.

C. E. Finney and E. W. Brooks, president and consulting engineer, respectively, of the London-Arizona Copper Co., have returned to Los Angeles from Kelvin, Arizona.

Lester W. Strauss has been examining coal lands near the Oroya-Huancayo railroad, Peru. He will proceed to Huancavelica to examine cinnibar deposits at that place.

S. E. Bretherton has returned from Los Angeles, where he was engaged in the investigation of an important new wet process for the extraction of copper and zinc from sulphide ore.

W. C. West, formerly superintendent for the La Republica Mining Co., now holds a similar position with the Dawson Mining Co., of Sonora, Mexico, where he is erecting a cyanide plant.

W. S. Keith left Seattle on October 11 for Cooke City, Montana, to there erect a 250-ton smelting plant for the New World Power & Reduction Co., for which he will be general manager.

Dividends.

On October 1 the Pinguico Mines Co., Guanajuato, Mexico, paid its first semi-annual dividend on preferred stock, of $60,000, which is at the rate of three per cent.

Latest Market Reports.

LOCAL METAL PRICES—October 22.

Antimony	12@16c	Quicksilver (flask)	$44@45
Casting Copper (scrap)	8½@13½c	Spelter	6¼@7c
Pig Lead	4.65@5.50c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Oct. 15. £. s. d.	Oct. 22. £. s. d.
Camp Bird	0 13 6	0 14 0
El Oro	1 5 0	1 5 0
Esperanza	3 8 9	3 5 6
Dolores	1 10 0	1 10 0
Oroville Dredging	0	0 9 9
Stratton's Independence	0 1 0	0 1 0
Tomboy	1 1 3	1 1 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Oct. 16	13.25	4.34	4.80	51½
" 17	13.25	4.28	4.80	51¾
" 18	Sunday.	No market.		
" 19	13.25	4.28	4.80	52
" 20	13.25	4.28	4.80	51½
" 21	13.25	4.25	4.80	51⅜
" 22	13.25	4.23	4.80	51½

MINING STOCK QUOTATIONS—NEW YORK.

Closing prices.

	Oct. 15.	Oct. 22.
Amalgamated Copper	76	79¾
American Smelting & Refining Co.	87⅞	90¾
Boston Copper	14	13⅞
Butte Coalition	24¾	26¾
Cumberland Ely	7⅝	7¾
Dolores	6¾	7¾
El Rayo	4	4⅛
Giroux	3⅞	4
Greene-Cananea	10	10¼
Indiana Sonora	5	5⅛
La Rose	6½	6⅜
Miami Copper	9⅞	10⅛
Nevada Consolidated	16⅜	16⅞
Newhouse	5	4½
Nipissing	8⅝	9⅜
Ohio Copper	3	3½
Tennessee Copper	42⅞	44¼
Utah Copper	41½	42⅞
Yukon	4½	4½

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, October 22.

Atlanta	$ 23	Laguna	$ 1.10
Belmont	1.15	MacNamara	55
Booth	40	Manhattan Con	6
Columbia Mtn	22	Midway	29
Combination Fraction	1.20	Montana Tonopah	86
Daisy	99	Nevada Hills	1.10
Fairview Eagle	25	Rawhide Queen	60
Florence	3.90	Sandstorm	24
Gold Bar (Bullfrog)	4	Silver Pick	17
Goldfield Con	6.00	St. Ives	29
Gold Kewenas	31	Tonopah Extension	60
Great Bend	37	Tonopah of Nevada	7.00
Jim Butler	23	Tramp Con	16
Jumbo Extension	33	West End	55

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

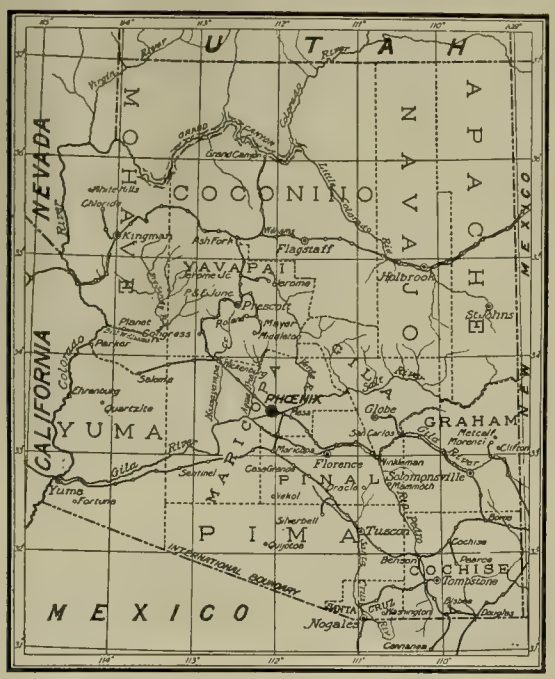
	Closing prices. October 22.		Closing prices. October 22.
Adventure	7½	Mohawk	64½
Ahmeek	110	Nevada Con	16¾
Allouez	37	North Butte	84¼
Amalgamated	79½	Old Dominion	49⅜
Arcadian	3½	Osceola	115
Atlantic	18¼	Parrot	28
Boston Con	13¾	Quincy	93
Butte Coalition	26½	Rhode Island	4
Calumet & Arizona	120	Santa Fe	1¾
Calumet & Hecla	660	Shannon	15⅛
Centennial	34	Superior & Pittsburg	15¼
Copper Range	74½	Tamarack	73
Daly-West	9¼	Trinity	17¾
Franklin	13	United Copper Con	10¾
Granby	100	Utah Copper	40¼
Greene-Cananea, ctf	10¼	Victoria	4¼
Isle Royale	22½	Winona	5
Mass	5¼	Wolverine	140

General Mining News.

ARIZONA.

MOHAVE COUNTY.

The mill of the Gold Road Mines Co. is now closed down and will be replaced by a larger one. The work in the mine continues and is centred on driving toward the Billy Bryan vein from the 500-ft. level of the Gold Road shaft. ——The rate on distillate, which formerly was $22 per ton, has been reduced to $17 from all California points to Kingman and Chloride, by a recent ruling of the Interstate Commerce Commission. The new rate goes into effect November 1.——It is reported that J. W. Derbyshire, who recently took a bond on the Abe Lincoln mine from Buchanan & Chittenden, is soon to arrive at Goldflat and will begin work on a 200-ft. shaft on the property. In the old shaft it is understood that an orebody averaging $17 gold was opened up.——It is reported that work is to start at once at the Nighthawk mine, and that the affairs of the Company have all been straightened out.——Dan Hanley and



Map of Arizona.

Jack Flynn have struck it rich in the Desert Prospect mine, owned by the White Hills Co. The find is in the old works west of the Occident mine and is said to be one of the best showings ever seen in that property, the ore averaging something like 2000 oz. silver.

YAVAPAI COUNTY.

Contracts have been let for a 700-ft. adit on a group of 12 claims two and a half miles southeast of the Brooklyn-Arizona. The bore will tap a large iron dike at a depth of 700 ft. The dike carries gold, silver, and copper and has the earmarks of a large copper and gold mine.——The Emporia Consolidated Mining Co. is also prospecting work on the Etta mine in the Black Hills district. The Etta is one of the oldest locations in the Black Hills and was among the producers a quarter of a century ago when the nearest railroad point was Ash Fork. The Company intends to carry down the Etta shaft several hundred feet deeper and open the vein, which is among the most promising gold propositions in the Black Hills range.——The Arizona Central Copper Co., whose property is six miles east of Dewey on the Bradshaw Mountain railroad, is considering the purchase of a hoist, compressor plant, and pumps. One of the surveys of the Arizona Power Co.'s transmission line passes half a mile east of camp and it is the intention to operate all the machinery at the mine by electric power as soon as the power company is ready to deliver its current to mining concerns. J. B. Cleveland is manager.

YUMA COUNTY.

The Clara Con. G. & C. M. Co., operating near Bouse, has put another gasoline hoist in operation during the past month and has also purchased a water-jacket blast furnace of 300 tons capacity and the iron work for a 75-ton reverberatory furnace. A drift on the 200-ft. level has been driven 70 ft. and is still in an oxidized zone carrying native copper. A cross-cut on the 200-ft. level uncovered copper sulphides and has been driven 90 ft. across the orebody with the breast still in ore. George Mitchell is president. ——The Cobralla Copper Co. is preparing to start active development at its property in the Ellsworth district nine miles northwest of Salome near Tank pass. Copper glance which carries $16 gold and 13 oz. silver in addition to the 11% copper has been found. Dick Hall is manager.

CALIFORNIA.

BUTTE COUNTY.

Increased activity is reported from Magalia ridge and the opening of the Cape Horn mine is sure to bring an era of greater prosperity. In addition, the Mammoth and Gunn channels are to be diligently prospected. Cohen & Gooday, of Magalia, are starting work and expect to drive a 600-ft. incline shaft to explore for gravel. In the Messila valley the Blue Valley Co. is making extensive preparations for active work. This Company has been amply financed by Eastern capitalists.——An order was entered in the U. S. Circuit Court, at San Francisco, on October 20 modifying the injunction of the Supreme Court of Butte county in the case of the City of Oroville *v.* the Indiana Gold Dredging Co. The order permits the defendants to continue dredging in the channel of Feather river on the condition that a 50-ft. cut be made, within 15 days, through the transverse ridge of tailing now across the channel. The order allows the Indiana company to continue depositing its tailing in elongation of the ridge which runs parallel with Feather river, but it cannot erect or maintain a ridge extending above the present level of the ground upon which the dredge may be working.

NEVADA COUNTY.

(Special Correspondence).—A heavy rainstorm prevailing for two days with excellent indications for a continued downpour, has solved the water question for a considerable period, and the various mines are making preparations for the resumption of activities. The repairs to the Empire mill are being rushed and the mine will be in full blast within two weeks.——The shaft at the Union Hill will be sent down 650 ft. and cross-cuts driven from the 600-ft. level to cut the vein developed at the 300-ft. point. Ultimately the shaft will be sunk to the 1000-ft. level. The shaft has been enlarged to a three-compartment to a depth of 350 ft.——A new compressor and concentrators have been purchased for the Central Con. mine and will be installed at once. A small force of men are employed and considerable milling ore has been blocked out. C. N. Bailey is manager.——Morgan & Richards, of Nevada City, have placed a crew of men at work on the Alma mine, at Deadman's Flat, sinking the shaft and driving on a small vein of rich quartz.——Arrangements have been made for the erection of a stamp-mill at the Brandy City mines.——The St. Gothard Mining Co., operating the Delhi mine, has declared a dividend of 5c. per share, the third for the present year.——It is expected that work will be resumed at the Gold Flat in a few days.

Grass Valley, October 19.

SIERRA COUNTY.

Robert Duree has formed a company to work the old Gardner vein near Poker Flat. The property was made to pay some years ago when a small home-made mill, the invention of Robert Forbes, was used.——It is reported that a company represented by F. Heide has purchased the Cox property, below Howland Flat, and plans to put in some

new machinery next spring. In the meantime development work is being carried on in two adits, in one of which three shifts and in the other two 10-hour shifts are working.——Work has been suspended at the Sierra Buttes mine at Sierra City and about 75 men have been thrown out of employment. How long the mine will be closed is not known, but it is expected that work will be started again soon.

TRINITY COUNTY.

The La Grange mine will start operations again as soon as a few minor repairs on the ditch are completed.——W. R. Hesselwood has begun prospecting the McCampbell gravel mines, at Hay Fork, and will probably operate this year if the results are favorable.——Sixty tons of ore recently shipped from the property on the Tom Greene road that is under lease to French Gulch men brought returns of $166 per ton.——W. V. Whipple, who is manager of the Trinity Gold & Timber Co., of Minersville, has recently returned from Minneapolis, where he arranged for the purchase of a large amount of new machinery to be used at the mines of the Company. Last season's work is said to have been very profitable and consequently operations are to be conducted on a larger scale henceforth.

TUOLUMNE COUNTY.

Work has been resumed at the Excelsior mine and the new pump handles the large flow of water satisfactorily. ——Charles A. Mau, of Los Angeles, has taken a bond on the quartz mine, near Jacksonville, belonging to Mrs. E. A. Jones.——A new company has begun the development of a promising property west of the famous O'Hara mine at Brown's Flat. The claim is called the Alta-Sonora and it is reported that prospects for gold are good.——It is possible that a company of Nevada capitalists may re-open the Bonanza mine.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Work was resumed this week upon the Josephine mine, on Kelso Mtn. The adit, now in 1100 ft., is to be driven ahead, while stoping will be started 1000 ft. from the portal of the bore. This property has just passed over to a company composed of Denver and Eastern men, Frank Babcock, of Silver Plume, having been appointed manager.——The Waldorf Metals Co., leasing on the Paymaster, Commonwealth, and Central Indiana veins of the Wilcox adit, as well as the Wheeling vein of the Tobin adit workings, has at last got work in full swing. The force is being added to from week to week and from now on regular shipments will be maintained. The product is to be sent to the smelters in Denver. The output promises to be heavy up until the time the Argentine Central railroad will be compelled to close for traffic for the winter. ——It is reported that work will shortly be resumed upon the Big Indian, Leavenworth Mtn. This property at one time was a good producer of high and medium-grade ore, but has been idle for a number of years.——Another vein has just been cut by the Montgomery-Ward adit on Republican Mtn. On the foot-wall a streak of heavy lead ore is showing that is from 4 to 6 in. wide. No driving will be started until the hanging wall is reached. W. C. Hood is manager.——What has developed into the 'biggest little mine' in the county is known as the Black Eagle, situated in Highland Park, on the opposite side of the mountain from Georgetown. In the drift west of the sixth level a body of ore is exposed that is 6 ft. wide, the assays of which vary from $5 to $25 per ton in gold. On the fourth level the streak is from 2 to 4 ft. wide, the content being from $5 to $18 in gold. A peculiar coincidence in connection with this mountain is that the ore mined on the Georgetown side has invariably been a silver product, while on the opposite it is always gold which has been found. The Black Eagle is operated by the Honest John M. M. & T. Co., J. F. Puchert, of Idaho Springs, being manager. A 40-ton concentrating mill is in continuous operation, an aerial tramway being used for the transportation of the ore.——The Raymond adit cut another vein during the week, considerable scattered ore being in evidence. The bore has passed the 1000-ft. point, but driving will be continued.——Work on the Rover, Griffith Mtn., is bringing results. In the breast of the adit a streak of heavy lead ore is showing that is 6 in. wide, the assays giving $28 in silver and lead. This vein is an extension of the Aetna, and is owned by N. Anderson.——Shipments are to be started from the Mountain Quail at an early date. The lead streak is over two feet wide, and test mill-runs show contents of $30 per ton in silver and lead. L. Hoery is manager.——Work on the Ben Franklin is being done under contract. Occasional bunches of unusually high-grade ore are being cut, but no solid streak has yet been found. ——The Scepter adit will reach the objective within the next 30 days. Work will at that time be started in making the raise to connect with the Sunburst adit. The re-timbering, enlarging, and reducing of the grade in the adit has been completed and everything is in readiness for enlarged operations. S. McKirahan is superintendent.—— The Jackson mill, which has been running on Sun and Moon ore, made a clean-up a few days ago, and the machinery has been started on a 200-ton run of Russel Gulch ore for J. G. Roberts.——P. Roberts & Co., leasing on the twelfth level of the Gem, sent out a carload shipment of smelting ore last week and received a settlement of $25 per ton net in gold. The streak measures from 4 to 8 ft. wide.——The Old Town Con. M. Co. announces that a mill will be constructed near the portal of the Newhouse adit, the initial capacity to be 100 tons per day. G. K. Kimball, of Idaho Springs, who is manager, departed last week for Pittsburg, to consult with the directors in regard to the construction of the plant. The Old Town has been for a number of years one of the heaviest producers of the district, and previous to the driving of the Hot Time lateral from the Newhouse adit, regular monthly dividends of 1% were paid.——A big body of medium grade ore has been found on the Silver Horn, at a distance of 700 ft. from the portal. The discovery was made in running a cross-cut to prospect the hanging wall. Assays of the streak show $16 per ton. The ore is ideally adaptable to concentration. L. McLean, of Idaho Springs, is owner.——Work is to be resumed in a few days on the Marshall-Russell adit, Covode Mtn., after a close-down of five weeks.

Georgetown, October 17.

GILPIN COUNTY.

Work has been resumed at the Illinois mine in Twelve Mile district in which a company of Denver men are interested. George Holland is in charge.——There is some talk of the Rochester people installing a larger plant of machinery on that property in the Pine Creek district, and of resuming active operations again.——Lumber is now being hauled up to the Wiedemann property at the head of Jenny Lind gulch to be used in building a shaft-house for the Union City M. & M. Co., in which Indiana people are interested, and in the meantime developments will be continued in the mine.——The management of the Smuggler mine, in Moon gulch, has purchased an engine, boiler, and compressor and are considering the addition of five stamps to the existing mill.——Grading was commenced last week on the extension of the lines of the Gilpin Tramway Co. in Willis gulch to the Anchor mine of the Hearne Gold & Copper Mining Co. Development is progressing rapidly at the mine and with the completion of the tramway Manager Kane figures that he will be able to ship in the neighborhood of 50 tons per day.——The Sherman & Macon Mining Co. is to let a contract for 200 additional feet on its 950-ft. adit on Silver creek. Frank L. Branham is manager.——A plant of machinery is being taken from the West Calhoun mine, at the head of Leavenworth gulch, to the Great Mammoth mine in Illinois Central district. The mine is owned by John Best & Co., and is to be worked by Gordon & Co. under a lease. Some ores are now being taken out of the main shaft with a whip arrangement.——It is reported that work of driving the adit of the Black Hills & Denver Mining Co., on the north side of Boulder Park is to be started again. Large ore bins have also been built at the head of the tramway leading to the mill and it is expected that

trial runs will soon be made at the Company mill on some of the ores.

SAN JUAN COUNTY.

Three shifts are at work at the Gold King mill, at Gladstone, and 40 stamps are dropping. The shipments of concentrate are averaging more than one car per day and it is estimated that the output for October will be more than 1000 tons.——Several carloads of lumber have already been shipped from Silverton for the mill at the Bonanza, and the grading will be started within a week. The management hopes to have the plant running before snow flies next year.——The Silverton shipments for October amounted to 2200 tons of concentrate and 1850 tons of crude ore, which represents about 13,000 tons of ore mined.

SUMMIT COUNTY.

The new gold dredge, under construction on the Mekka ground by the French Gulch Dredging Co., is nearing completion and will be placed in commission this fall. This will make the fourth dredge in active operation in the Breckenridge district.——Work has started on the Wapiton group near Georgia pass.

TELLER COUNTY.

Henry Yohe, general manager of the Francesca M. & L. Co., will start active operation on the Roxanna property on the northwestern slope of Raven hill. The Company will put the block of ground on which it will operate in shape immediately and as soon as machinery is put in will start active development work. Some time ago the Roxanna property was blocked out for leasing purposes and of the eight blocks, six are now in active operation by lessees.——Cripple Creek men have secured a lease on the Phoenix property of the Isabella Mines Co. and are now engaged in putting the property in shape to operate. A complete plant of mining machinery will be purchased and active work started.——J. K. Lewis, of Cripple Creek, who has a lease on the Bob Lee claim of the Bob Lee Con. Mining Co., has struck ore in a drift from the 100-ft. level, which assays $25 per ton gold. He will put up a new hoist and make a trial shipment at once.——The surface buildings of the Gold Sovereign mine, at Cripple Creek, were destroyed by a fire, on the night of October 15, believed to have been of incendiary origin. The loss is estimated at $30,000.

IDAHO.

IDAHO COUNTY.

(Special Correspondence).—W. S. Smith, of San Francisco, has been examining the Cleveland group of claims, in which he is interested, and stated on leaving the district, that the mine would be put under development late this fall. The property is about eight miles from Elk City.——John Massam and associates have bonded their group of four quartz gold claims near Elk City to J. R. Painter, of Wyoming, for $60,000. Work will be begun at once on the driving of two adits to tap the ore at about 100 or 150 ft. Cabins are now being built. A water power capable of running 10 stamps is also under Mr. Painter's control, and he expects to erect a small mill next summer. Mr. Painter also bonded the placer workings of Joseph Aiken, which have yielded a small amount of gold, but have not been extensively developed. The gravel is loose and there is an abundance of water for giants.——George Stonebreaker, who owns the Buckhorn group of quartz claims on Crooked river, has stopped operations for the winter. He reports having made a satisfactory clean-up late in the season with an arrastre, but that this method recovers but little of the gold, and will be replaced by a small modern mill next spring.

Elk City, October 17.

SHOSHONE COUNTY.

(Special Correspondence).—The Murray Development Co. has been organized, composed chiefly of Boston capitalists, for the purpose of developing and controlling the Mother Lode group of 11 placer claims. The consideration has not been made public, but it is understood that the amount involved is large. The property is equipped with a 10-stamp mill and more than $1,000,000 worth of gold has already been taken from the ground. As soon as all the necessary details have been completed it is the intention of the Company to work both the mine and mill to full capacity.——E. M. Smith has sold the control of the Golden Winnie Tungsten M. & M. Co. to Arthur Amon, of Kennewick, Wash., and associates. The cash consideration was in the neighborhood of $75,000, but Mr. Smith still retains a large interest in the mine and will occupy the position of manager. It is the intention of the new management to install a concentrator especially designed for the treatment of tungsten ore. The ore-shoot has been opened up for many hundreds of feet, while the assays show that the gold content alone will be more than sufficient to meet all transportation and treatment expenses. The mine is advantageously situated on the line of the Idaho Northern railroad.——A movement is afoot for the driving of a big 7000-ft. adit, on a co-operative plan, for the development of a number of the Murray mines. This adit can be driven practically from the tracks of the Idaho Northern railroad and will tap at great depth the ore-shoots of the Bear Top, Chicago-London, Black Horse, Paragon, the Jewell group, and the Orofino properties, all of which are ready to commence shipments as soon as the Idaho-Northern railroad reaches that point. The cost of this project is estimated at $75,000, but those who are promoting the scheme claim that the value of the blind shoots cut would be more than sufficient to meet all expenses. At the portal of the adit is an extensive mill-site, and it is possible that a large capacity concentrator will be erected for the treatment of the ores.——Work in the face of the lower adit of the Chicago-London Co. has been commenced again this week with a force of ten men. The work is handicapped for want of power owing to the shortage of water. With the recent rains, however, it is believed that the Company will soon be able to start up the 15-drill compressor, owned jointly with the Paragon Co., and to increase the force at work. The largest orebody in this mine has already been opened up for a distance of more than 500 ft., and is several feet wide almost all the way. This vein has been traced on the surface for over 2000 ft., and it is the intention of the Company, as soon as the railroad has guaranteed reasonable transportation facilities, to erect a 150-ton concentrator especially adapted for the treatment of zinc ores.——Work on the property of the Corrigan mine is about to be resumed by the Federal Mining & Smelting Co. This property has been closed down ever since the recent depression on the metal market, but it has now been announced that extensive improvements are contemplated. A 20-drill compressor and motor have been ordered, and an electric pump will be installed in the 300-ft. level. As soon as this machinery has been installed a force of between 60 and 70 men will be employed.——Herman J. Rossi, of Wallace, has just completed a transaction by which he has secured the one-sixth interest in the Amazon-Dixie mine, in the Saltese district, owned by Mark Everett. The consideration was $20,000. Very little development has been done on the property, but one of the best showings in the district has been made. A large amount of equipment has been installed and already a deal has been consummated for the sale of 100,000 shares in the new organization at a high figure.——Shipments of ore from the Butte & Coeur d'Alene property will commence as soon as the Company has finished the wagon-road at present under construction. This decision was reached at a recent meeting of the directors. The property is between the Hunter and the Snowstorm mines in the Mullan district, and last week a strike of three feet of ore averaging about 11% copper, 7% lead, and 300 oz. silver was made in the face of the drift on the vein from the end of the 500-ft. adit. This ore has already been proved to a distance of about 100 ft. and one car is now ready for shipment.——Still another suit has been commenced by the Federal Mining & Smelting Co. against the Bunker Hill & Sullivan Co. This suit is of the nature of an adverse claim, in which the Nellie property, owned by the Federal, is said to conflict with the Cheyenne claim owned by the Bunker Hill & Sullivan.

Wallace, October 17.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—One of the most active tracts in the entire district is the Turkey creek bottom, northeast of Joplin, where there are seven companies actively at work. The latest addition to the operators is Kennedy & Yount, who have taken a lease upon the Perry land lying east of the Kalitan tract. A drill will be put upon the land at once.——In the same vicinity Snyder & Watkins have opened up the old Cardinal lease and are now taking the ore from the old drifts. The water has been overcome by a centrifugal pump which has been used for the past few weeks. This mine was at one time a great producer, but work was abandoned on account of its being nearly flooded. The adjoining companies would not aid the Cardinal in pumping, and it found it impossible to keep the water from so large an area. The mill was moved away and the mine remained inactive until the present company began working this summer. The ores will be cleaned upon hand-jigs.——The Florence Mining Co., near the above leases, has struck a rich run of galena at 40 ft. The ore occurs in large chunks weighing as high as 50 to 100 lb. This is the fourth strike upon the land within the past year. Two distinct runs are being worked, both rich in galena and zinc-blende.——The region southeast of Joplin is also active. The old Carnegie-Galena mine has been sold to the Grace Holmes Co., but the consideration has not been made public. This is one of the old producers, having turned out in one week over 200,000 lb. of ore on a battery of hand-jigs. This ore came from the shallower levels at 120 ft., but recently ore has been found by drilling at 160 to 210 ft. Hand-jigs will still be used by the new Company, but when the lower levels are worked a new mill will be constructed, and thus secure a 5% reduction in royalty. Work will begin by the last of October.——A shallow lead strike has been made on the Wilkes land southeast of Joplin which has caused much interest and stimulated activity on adjoining leases. The ore was struck at 30 ft., and is of exceptional richness. It appears to rival the rich strike made in the Leadville Hollow camp a few weeks ago. The ore is in almost pure chunks and requires no crushing or jigging. It is ready for the market when the mud and clay are washed off. Neighboring leases have been snatched up and a number of shafts are going down rapidly in hopes of striking the same run.——An Eastern company under the management of Harry Kingsbury has taken over the lease worked by A. P. Clarke and associates and has installed a large centrifugal pump in the shaft, which is 140 ft. deep and in good ore. The former company gave up the work on account of excess water. A high-grade zinc-blende, resembling the grade found in the well known Bumble Bee mine, is found there. The mine is in the southwest corner of the famous Thousand Acre tract.——Another find of great importance was made in the Alladin mine at Spring City. While running a drift from No. 6 shaft, just above the 100-ft. level, a run of zinc-blende was uncovered. It is of the 'rosin jack' variety and is as nearly pure as any ever found in the district. A new shaft is being sunk at the mill which will be used to open the new orebody and the No. 6 will be abandoned.——Another run of zinc-blende has been opened in the Hallowe'en mine, where a new shaft has just been sunk to the ore level, which is at 160 ft. Driving will be started at once and a 100-ton mill erected before winter. The Hallowe'en is on the crest of the hill, while most of the other mines in this camp are in the valley.——Plans are under way for the re-opening of a number of plants which have been closed for some time past, one of which is the Bumble Bee, southeast of Joplin. Pumping machinery has been installed and as soon as the mine is drained workmen will be put into the drifts. A shaft is being sunk during the draining of the ground. The water problem is serious, as the drifts are large and numerous, and many idle mines in the vicinity are filled with water and must necessarily be drained by the Bumble Bee pumps.——The large galvanized plant of the United Zinc Co., at Duenweg, will be re-opened as soon as the ground is drained. This mill was new last year and has not been run long, as operations were suspended when the panic came. The property is well developed with two shafts to the ore-level, where a rich sheet run of zinc-blende has been opened. The plant is one of 500-tons and one of the best in this part of the district.——The Endeavor mill, recently completed on the Prudential lease, is now operating upon a rich galena and zinc-blende run at 216 ft. The mine is turning out more than half galena, the 18-ft. face of ore having a 3-ft. face of galena at the top and also the same at the bottom of the run. A new shaft is being sunk near the mill, while the ore at present is being hoisted from an old shaft, and being trammed a long distance to the mill.

Joplin, October 17.

NEVADA.

ESMERALDA COUNTY.

A station is being cut at a depth of 630 ft. on the Jumbo, one of the Goldfield Consolidated properties, to connect with the main shaft of the Mohawk, which is down 600 ft. When this is done the work of sinking to cut the main Mohawk vein and ore shoot will be continued.——The Goldfield Cl mill, at Goldfield, has been completed and began operation last week. It uses what is known as the Greenawalt Electro-Chlorination process. The leaching solution is generated from sodium chloride by means of an electric current, and the precipitation of the dissolved metals is also aided by electrolytic action. This process is claimed to be effective for the extraction of both gold and silver. ——The Zinn-Florence is installing air-drills, preparatory to starting prospecting the Jumbo Florence dike. For the present the power will be obtained from the adjoining Florence Consolidated lease.——A five-drill compressor and a 30-hp. electric hoist were installed last week on the Florence Consolidated by M. T. Kieley, who has completed the installation of a 100-hp. hoist on the Goldfield Florence. ——Two shifts are rushing work on the 315-ft. level of the Gotwaldt lease, under direction of T. D. Van Devort and J. H. Grant. Driving is progressing in both directions, the hanging wall having been reached last week.——At a depth of 614 ft. a station was cut last week in the Claremont shaft, which will be one of the principal working shafts of the Goldfield Con. A cross-cut is being run to connect the Claremont with the Mohawk.——The Rockland Syndicate Mining Co., owning the famous Rockland mine, near Mason Valley, is making preparations for the installation of a modern reduction plant for the treatment of its ores. This mine has been developed to a depth of 1000 ft., and has blocked out and in sight, according to the reports of competent engineers, 70,000 tons of milling ore that will average $10 per ton.——The Rawhide Mining Co., together with the St. Ives Leasing Co., for both of which A. A. Codd is president, announce that they will build a 10-stamp mill at Modoc, the junction of the Southern Pacific and the Rawhide Western, six miles below Schurz. The first unit will have a capacity of 50 tons per day and construction will be started as soon as the Rawhide Western railroad is completed.——The mines of Goldfield produced during the week ending October 17 a total of 1896 tons, of an estimated value of $149,360. During the same period the Tonopah mines produced a total of 5135 tons estimated to be worth $131,700.

NYE COUNTY.

During the past week the east drift from the No. 2 shaft of the West End Con., at Tonopah, has made connection with the west drift from No. 1 shaft on the 400-ft. level, and from now on all ore will be hoisted from the No. 2 shaft. The old ore house near No. 1 shaft has been torn down, and the new bins, which are nearly completed, will be used for the sorting and loading of all ore from the mine.——The work of sinking the Stone Cabin shaft, of the Jim Butler, to the 700-ft. level was completed last week, the bottom being down 707 ft. This will give the Company an additional depth of 200 ft. over the old workings, and prospecting from the bottom of the shaft will be started as soon as the station has been cut. The opera-

tions are still confined to the different levels from the Stone Cabin shaft, no work being done through the Wandering Boy. The ore shipments last week consisted of 240 tons to the Belmont mill at Millers.——The old Jefferson mine, now known as the Charles Konrahat, near Round Mtn., has been purchased by Charles Brennenman, J. Flick, and W. H. McBeath, of New York, for the sum of $350,000. The new owners expect to sign a contract at once for the erection of a $75,000 milling plant. The mill has already been selected, and the order for shipment has been awaiting the closing of the contract for the purchase of the mine. The plant will have a capacity of 200 tons per day, and will be in operation, it is thought, by the first of January.——The Taylor Bullfrog Mining Co. is again working its property near Beatty.

OKLAHOMA.

OTTAWA COUNTY.

(Special Correspondence).—The Miami camp still holds its own with the older camps of the district. The most important development is the discovery of a lower run of ore on the lease of J. W. Barnes. Seven drill-holes showed the deposit occurring at 144 ft., and continuing to 165 ft., the whole 19 ft. averaging over 20% zinc-blende. Another development of deep ore was made by P. C. Campbell near Tar creek. The development of deep ore is an important one, as it not only assures a longer life to the camp, but the ore found at the lower level is of a much higher grade than is found at the shallow levels, where the mines in the camp have been taking the ore.——The Miami-Yankee Co. has purchase the old McCord mill, in the Joplin district, and has moved it to the lease in the Miami camp. The mill has been run only a short time, but it will be improved and adapted to the ore in the Miami camp. The Company has been studying the different mills with a view to installing the best features in the new plant, as no mill so far has proven entirely satisfactory in handling the Miami ore. Besides this mill three other plants are being erected in the camp, namely, the Muskogee, Golden Hen, and Dan Isley. Considerable development work has been done in each mine preparatory to the erection of a mill. Seven plants are already operating.——A strike was made on the Last Chance lease while working in a drift at 105 ft. The face covers the entire drift, which is 7 ft. high. This Company is also sinking a shaft on the Blue Bell lease to the east of the present workings. The drill-hole upon which the shaft was sunk showed 10 ft. of rich cuttings at 108 ft.——Call Bros., of St. Louis, have bought the controlling interest in the Maxine mine and will sink the shaft 20 ft. deeper and erect a mill. One of the best drill-strikes of the camp was made on this lease. The Wauhillua also has under consideration the erection of a 200-ton mill.

Miami, October 17.

WASHINGTON.

STEVENS COUNTY.

(Special Correspondence).—Owners of mines in the Metaline district have interested several local capitalists in the building of an electric railway from Metaline to Northport, a distance of 20 miles, to haul out the ores that are now beginning to be produced there. The camp has been under development for three years, and contains valuable and extensive lead deposits, yet its isolated situation has entirely prevented its being worked profitably. Several plans for getting out the ores have been attempted, but so far have proved too expensive. The Box canyon, on the Pend d'Oreille river, has until within a few weeks prevented steamers from reaching the district, thus making it necessary to haul supplies and such ore as was desired for testing, a distance of 12 miles up-hill to a safe landing. The railway is still 60 miles away, while egress westward across the mountains to the S. F. & N. railway is out of the question. Roads have been cut, only to prove failures so far as the ore was concerned. Recently a steamer has been built for the Box canyon run, that can take the ores out to the south, where they can be distributed over the Great Northern and the Northern Pacific systems to the smelters. The present plan, however, far surpasses all others yet proposed. A suitable grade has been roughly surveyed to Northport, and as the distance is but 20 miles and there is abundant water-power for generating electricity, an electric line seems to be a feasible outlet. It is stated by those interested that $200,000 has been virtually promised, contingent upon final agreement of the Northport smelter people to install a lead stack. This has been promised informally, and it is now believed that the matter is accomplished. If nothing happens to prevent, work will by commenced this fall, and by early spring, it is said, the road can be in operation. It will be a boon to several properties worthy of attention. As further evidence of the growing importance of the district, R. A. Blackwell, general manager for the Idaho & Washington Northern railway, announced a few days ago that his line will be extended next summer to Ione, which is but 12 miles from Metaline, and that a survey is now being run through to the camp. This will at once afford competing rates on treatment and transportation by rail, and will doubtless cause an expansion of the mining industry at Metaline.

Metaline, October 17.

CANADA.

BRITISH COLUMBIA.

The Hidden Creek Copper Co., of Seattle, has recently made the final payment of $30,000 on a $100,000 option on the property lately acquired from J. T. Hillis and others of Vancouver. The mine is at Goose bay, about 100 miles from Prince Rupert. A compressor, pipe line, and machinery is being put in and development carried on.——The Dominion Copper Co. has commenced the erection of a new machine shop at the smelter to replace the one destroyed by fire some weeks ago. Orders have been placed for new machinery to equip it.——The Granby company will shortly install a new heating system at their powder thaw, replacing steam by electricity. Air will be heated by means of electric coils and blown by a fan into the thaw. If the new system operates satisfactorily a similar one will be put in at the Gold Drop.——The mines of the Dominion Copper Co. have been closed pending a re-organization of the Company. The low metal prices, the recent fuel troubles, and payments of interest soon to be met, will, it is said, result in the appointment of a receiver. The physical property of the Company is in good shape and with the advancing metal market and a reorganization of the concern, the present shut-down should not last long.——Tenders for the construction of 300 miles more of the Grand Trunk Pacific Railway in British Columbia will be called for within the next 30 days. Of this, 200 miles will be west from Wolf river, and 100 miles eastward from the end of the 100 miles already being constructed along the Skeena.

ONTARIO.

Peter King, an American prospector, reports that he has found very rich ore in the Sturgeon Lake district, where he has been prospecting since early summer. He has much rich ore to back up his statements and shows some nuggets weighing over an ounce each. It is the richest gold find ever made in that part of Canada or in the whole Dominion, even eclipsing the rich mine near Wabigoon owned and operated by Anthony Blum of Boston. King has refused several large offers for the property.

YUKON TERRITORY.

The big ditch of the Yukon Gold Co. from the head of the Twelve Mile river to Bonanza creek, a distance of 70 miles, is practically completed. It was originally intended to turn the water in this season, but it has now been decided to wait until next spring. The work has been continuous during the past three seasons and involves a total expenditure of approximately $3,500,000. Two thousand men have been employed, two-thirds of which have been working on the pipe-line. The ditch is wide enough in places for three teams to drive abreast, and will carry 20,000 inches of water. The pipe line varies from 46 to 49 in. and has a capacity of 5000 inches. The engineers in charge are O. B. Perry and Chester A. Thomas.

Special Correspondence.

NEW YORK.

Greene Gold-Silver Co.—W. B. Thompson on Copper.— Quicksilver Production.—Mining Stock Market.

The Greene Gold-Silver Co. appears to be in a bad way. Some months ago a committee of stockholders, including two directors, was formed to investigate thoroughly the physical and financial conditions of the Company, but as less than $10,000 was raised of the $25,000 necessary to obtain reports, the examination was abandoned, and there is little hope of the Company giving any return to the stockholders on their investment. Organized as a Mexican corporation, the Greene Gold Silver Co., S. A., owns title to all the properties, and the West Virginia Co., the stock of which is widely scattered, has as its only asset the stock in the Mexican company. According to the statement of a director this Mexican stock has been hypothecated, and the American company loses its assets, as it is said that the properties are to be sold at auction shortly to satisfy the loans of the Mexican banks. This marks the last stage of a fine example of how not to finance mines.

Regarding the future of copper, W. B. Thompson is quoted as follows: "I am looking for a temporarily uncertain stock market because of political conditions, but all my reports indicate that the election of Taft is assured and the market should begin to discount that fact about two weeks before election. As to copper, it is apparent that the European market is pretty well sold up. Not only the manufacturers, but the speculators as well, have loaded up with cheap copper, so that we cannot expect much help from the other side in assimilating our production. At the moment it is evident that we are producing more copper than we are consuming, but as there is still a considerable amount to go to the other side, and the American consumption is increasing, it may be a month before copper begins to accumulate in this country. The producers of copper appreciate the situation, and are prepared to carry their copper until the resumption of business late this year or early next year, when the price of copper is bound to advance. I am not so sure but that the consumers, appreciating this situation, will begin to stock up in anticipation of future needs, in which case we may get higher priced copper immediately after election."

An interesting comparison is made between the mining camps of Butte, Montana, and Cobalt, Ontario. Each of these camps is expected to show net profits this year of about $7,000,000, but Cobalt will get this from the production of 18,000,000 oz. of silver from 20,000 tons of ore, while Butte will have to treat 4,000,000 tons of ore to obtain the net returns in copper and silver.

The total production of quicksilver in the United States for the current year will probably be about 17,000 flasks, which will be the smallest for many years. The production since 1904 has been as follows: 1904, 32,000 flasks; 1905, 25,000; 1906, 22,000; 1907, 18,000; 1908, 17,000.

The steady decline is due to the gradual exhaustion of the orebodies, and while 5 years ago there were 20 mines in the country producing quicksilver there are now only 10. The mercury mines owned in Boston now produce 70% of the entire United States output; the New Idria Quicksilver Mining Co. yields 800 flasks per month, or 9600 per year, and the Napa gives 2400 flasks annually. The New Idria is producing more than ever before and is working in high-grade ore with the largest reserves in its history. With the quarterly dividends declared last week the Company has paid out in 11 years $1,050,000, or $10.50 per share, more than twice the original subscription price of $5. Beginning with April the Company has increased its dividend from 20 to 30c. quarterly. The present price of quicksilver is $43 per flask, compared with $40 last year, and the demand absorbs the entire production.

The market for mining stock has somewhat improved. The general sentiment on the New York 'curb' is bullish, and brokers expect a season of prosperity for the mining industry after the election. This is based on the showing the mines have made during a year of depression; development and construction have been pushed, and output and dividends have been maintained better than was expected. While the majority of the actual sales of mining securities are not recorded on the curb, and the prices quoted there are not always representative of the value of a property, this institution is a valuable indicator of the feeling of the outside public with regard to mining securities. The Goldfield Consolidated stock has been a puzzle to some operators. It varies between $4.50 and $7, and large buying orders placed by outside interests to cause a market movement have failed to raise it above the latter figure, as the stock has been freely offered by those in control at any advance. It is suggested that the reason why the insiders are opposed to any big movement may be found in the history of Nipissing, which advanced from $9 to $33 per share in two days. The public bought heavily at high prices, and when the decline came and investors lost their money the whole Cobalt camp was injured, and it has taken two years for it to recover its prestige. For this reason the Goldfield insiders may have determined to keep the stock within reasonable limits, and so retain public confidence and attract permanent investors rather than speculators. The new mill is now approaching completion, and if the tests in February are satisfactory a big rise is expected in stock, as its intrinsic value will then be much higher. The wisdom of the present course will be seen if the mill does not do as well as expected. Even in that case the stock is so well controlled that the decline might be small and the investors would continue to give support.

LONDON.

Sir George Livesey, Engineer and Economist. — Venture Corporation Re-organization. — Tungsten Production from Cornish Ore. — Tomboy Gold Mines.

By the death of Sir George Livesey, this week, England loses a noteworthy example of the honest business man and able engineer. Though connected, not with mining, but with gas manufacture, he deserves a corner in your pages because of his methods of dealing with capital, profits, and labor. He was born in 1834, and when 14 years old entered the service of the South Metropolitan Gas Co., which has the monopoly of the supply of gas over practically the whole of the south of London. For 60 years he was connected with this Company. He joined the board of directors in 1882, and from 1885 until his death he was chairman. His qualifications as engineer may be gauged by the fact that he was a member of council of the Institution of Civil Engineers. One of the most noteworthy theories of Sir George was that dividends paid by monopolies or protected industries should be in the inverse ratio to the prices charged for the commodity supplied. That is, if the profits increased, the surplus should be devoted partly to the reduction in price and partly to an increase in dividend. In this way the monopoly is prevented from becoming bloated. Shareholders receive a fair return on their money and the public is served well. Economy and efficiency of administration become responsible for prosperity and success, and not the mere possession of the monopoly. Sir George was also a great supporter of the claims of the workmen, and devised many methods of making the men interested in the business, though it was not without a severe fight against the trades unions that his system was originally inaugurated. In fact, the celebrated gas strike of 1889, when south London was lit by candles and oil-lamps, was one of the severest contests that I remember. The scheme then put forward offered such men as agreed not to strike or in any other way injure the company, an annual sum as bonus, calculated as a percentage of the wages and determinable by the price of gas. The men would have the option of receiving the bonus in cash or of leaving it in the hands of the Company at 4% interest.

This was an honest proposal, but the trades unions resented it as an interference with the reason for their existence. After two months the men came to terms, and everything has worked smoothly and satisfactorily since. At the present time, the workmen own £350,000 worth of shares in the Company, and have three representatives on the board of directors. The low price of gas will be a wonder to Americans, for it is never higher than 60 cents per thousand cubic feet. There is an excellent pension fund for such as have been in regular employ. It was Sir George who first inaugurated the system of penny-in-the-slot gas cookers, which brought the gas fire within the means of the very poorest, and incidentally improved the air of London.

I wrote a few weeks ago of the improvement in the position of the Venture Corporation, and mentioned that for the first time in eight years a balance sheet and report had been issued. The directors have since considered the advisability of reconstructing the Company and amalgamating with it the other companies that are more or less affiliated with it, namely, the London & Continental Investment Corporation and the Mines Corporation of New Zealand. Their scheme has now been circulated among shareholders. The new company is to be called the Venture Corporation 1908 Limited. The capital is to be £250,000, in 1,250,000 shares of 4 shillings each. For every 100 £1 shares in the old Company, 23 fully paid and 100 credited as 2s. paid will be allotted. For every 100 £1 shares in the London & Continental Investment Corporation 63 shares credited as fully paid and 50 credited as 2s. paid will be allotted. For every 100 shares in the Mines Corporation of New Zealand 9½ shares credited as fully paid and 12½ credited as 2s. paid will be allotted. If all the shareholders come into this scheme, 345,832 fully paid shares and 680,000 partly paid shares will be issued and £68,000 new working capital will be available. I believe a large proportion of the old shareholders will content themselves with the acceptance of the fully paid new shares, and will fail to take up the new shares that carry a liability. The directors are of the same opinion, for they have arranged for the underwriting of 400,000 of the partly paid shares. This new scheme will be placed before the shareholders at an early date.

An interesting development of the Cornish mineral industry is the formation of a new company called the Tungsten Metal Co., the object of which is to produce metallic tungsten and tungsten salts from Cornish ores. This Company has been floated by the Allen & Meyerstein group, which has done so much to develop Cornish mines, such as South Crofty. It is not quite correct to call the Company a new one, for it is really a reconstruction of the Tungsten & Rare Metals Co., which was run by Steinhart & Vogel in South London for a number of years. The old venture was started before the supplies of wolframite were made available by the introduction of the magnetic process for separating it from the tin with which it usually occurs. At the time the Company relied chiefly on Spain for its source of supply, and had a contract with the San Finx company. Partly owing to the difficulty of obtaining suitable supplies of ore in competition with the German producers, and partly because of the site of the factory, in South London, where the cost of carriage of raw materials, such as acid alkali and fuel, was a serious item, the Company was not a commercial success. Its reconstruction at the present moment is opportune. The new works are to be at Widnes, in Lancashire, in the centre of the coalfields and chemical industry, and the supplies of ore will come freely and on good terms from Cornwall. Mr. Vogel is to be manager, and Dr. Steinhart will act as consulting chemist. The consumption of tungsten in England at present in the manufacture of tool-steel and salts is about 1500 tons per year, and it all comes from Germany, some of it being smelted from Cornish ore. The use of tungsten for metallic filaments of incandescent lamps will provide a new market for the metal; at present these lamps are made in Switzerland, but, to comply with the requirements of the new British patent law, a factory will shortly be established in the midland counties. The Tungsten Metal Co. is a decidedly interesting venture, and should be strongly supported.

Savage Basin, Colorado.

A. Upper Tomboy Workings. B. Old Tomboy Mill. C. New Tomboy Mill. D. Japan Mine.

The Tomboy Gold Mines Co., which owns the Argentine group, at Telluride, Colorado, is now working in lower-grade ore, but by a judicious mixture of the poorer quality from the lower levels with the better class from the upper workings, the successful operation of the mine will be continued for years to come, though the monthly profits will be reduced. For some time the profits have been about £8000 per month, but in future these are expected to be reduced to £5000. It is not proposed at present to develop

farther in depth, but thoroughly to open the ground already partly developed. The reports issued by the Company do not give definite figures relating to the lower-grade ores now forming the bulk of the ore reserves, but presumably the recoverable value will be about $7 per ton, as compared with $10 hitherto. This, averaged with the better grade, would give about $8 for some years to come, and yield the £5000 profit per month indicated by the directors. [An abstract of the annual report of this Company, just issued, will be found on another page of this issue.—EDITOR.] The ore reserves have been well maintained, and amounted to practically the same figure as a year ago, namely, 400,000 tons, but no estimate is given of their content, so their relative value can only be guessed. It is interesting to note that additional plant has been erected during the year for the object of treating the middling produced in concentration. By means of additional classifiers, Wilfley tables, roasting-furnaces, and magnetic separators, the copper and zinc products can be separated from the pyrite, and marketable products obtained. This plant was first put in operation in January, and has gradually been brought to a state of high efficiency.

COBALT, ONTARIO.

September Output. — Preparations for an Active Stock-Market. — Work in Outlying Districts.— Gold Excitement at Sturgeon Lake.

The output of the Cobalt mines for September, amounting to 3322 tons, is the largest for any month in the history of the camp. Hitherto the record month was November 1907, when the shipments were 2516 tons. The first place was held by the Nipissing mine with 607 tons. The Drummond shipped 541, and the La Rose 460. Shipments for October thus far have not been on so heavy a scale, those for the week ending October 10 amounting to 465 tons from the following mines: Cobalt Central, 20; Kerr Lake, 40; La Rose, 60; Nipissing, 130; O'Brien, 95; Temiskaming, 30; and Temiskaming & Hudson Bay, 90. Prices on the stock market have generally held firm, with occasional spurts due to favorable reports affecting particular mines, but there has been no great buying activity. A powerful factor in maintaining prices is the general expectation that as soon as the Presidential election is fairly over in the United States there will be a great demand from American investors, as a result of the recent visits made to the camp by many American financiers and mining men. This is anticipated whatever the result of the election may be, as in the somewhat unlikely event of Bryan's election it is pointed out that Canadian investments would have special attractions as being beyond the range of American legislation unfavorable to capital. In expectation of an active market there have latterly been numerous new flotations and re-organizations. The Otisse Mining Co. has been incorporated with $2,000,000 capital to develop the Otisse mine at Silver lake on the Montreal river, with Frank C. Loring as engineer in charge. There is a 2-ft. vein running across the property with silver extending for 6 or 8 in. into the wall-rock on either side, the metal content being estimated at from 1500 to 2000 oz. per ton. A few days ago another find of native silver of large extent was made on the surface. A large force of men is at work. The Little Nipissing Co. has decided to increase its stock from $650,000 to $1,000,000 to obtain funds for the development of a 12-in. vein which runs under the lake, in working which it is expected to prove the value of other veins which may be found. A recent discovery at the Nancy Helen is proving rich in native silver and contains about 10,000 oz. silver per ton. The Company will open up this vein at three different points, driving each way. The Beaver has opened into a stringer at the 200-ft. level, showing good silver content and supposed to be an off-shoot from the big Temiskaming No. 2, which the Beaver has been for some time endeavoring to reach. At the Trethewey a calcite vein rich in silver has been found at 100 ft., at a distance of 1300 ft. northerly from the main workings, near the Hudson Bay boundary. The Warner property of 200 acres in Bucke township, where a massive cobalt vein was worked last winter, has been bought by a Chicago syndicate which has organized the Agaunica Mines Development Co. There is a shaft on the property down 125 ft., and 175 ft. of driving has been done, but recently the plant was burned and work discontinued. Silver has been found at the bottom of the shaft and other silver-yielding veins have been traced. A new plant has been ordered and development will be pushed. New buildings are to be erected on the Cochrane property to replace those recently burned, and the shaft near the Temiskaming will be sunk to the 200-ft. level. A rich orebody has been cut at the Nova Scotia at the 140-ft. level of the main shaft. The vein has widened from 6 in. to 2 ft. A concentration mill will be installed.

H. E. T. Haultain, a prominent mining engineer who has had experience in important positions in British Columbia, South Africa, and the Western states, has been appointed associate professor of mining in the faculty of Applied Science, Toronto University. Walter H. Aldridge, general manager of the Consolidated Mining & Smelting Co., was in Cobalt last week arranging for the shipment of low-grade ores for treatment at the Trail B. C. smelter. There is a rush of prospectors to the Sturgeon Lake, Algoma district, goldfields. Peter King, the original discoverer of gold in that area nine years ago, has recently returned from Sturgeon Lake to Port Arthur, with some very rich specimens. A number of locations are being taken up and a large amount of ore sacked for shipment. The ore is reported to be so rich that it can be sent direct to the smelter.

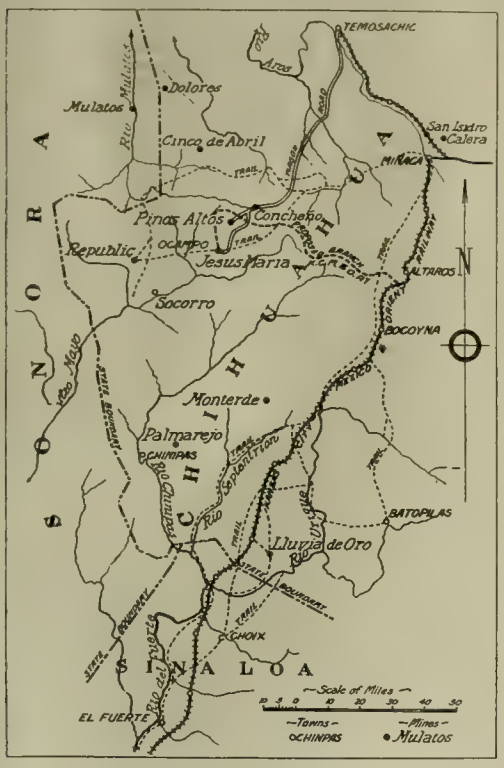
MEXICO.

Changes in Railroad Rates.—New Construction at Pachuca. —Developments in Guerrero. — Mine-Consolidation at Cananea.— Increased Activity in Chihuahua. — Re-organization of Alvarado Consolidated.

The Railroad Commission has not rendered a decision on the increased rates demanded on imported coal and coke. It has been shown that the domestic production for the last half of 1907 was 480,000 tons of coal and 60,000 tons of coke, whereas the consumption for the same time was 710,000 tons of coal and 240,000 tons of coke. If, then, the Mexican producers could increase their output 50%, which they claim to be able to do, it would just satisfy the consumers of coal, but would still leave a shortage of 150,000 tons of coke. To increase the railroad rates as asked, without discrimination, would be an unjust and unreasonable burden upon the consumer, and it is not believed the commission will allow the full increase as asked. It is probable, however, that some plan will be made to protect the home product at competitive points, that is, from Monterey and Torreon north, and including possibly San Luis Potosí, but not Aguascalientes or Mexico City.

At the Real del Monte, in Hidalgo, where the successful treatment of Pachuca ores was first accomplished, enlargements have already been made. The Loreto mill is to be made a duplicate of the Guerrero. The new 300-ton mill of the San Rafael y Anexas has 40 stamps of 1000 lb. and 20 of 1200, dropping in weak solution; from these the pulp goes to classifiers and thence to three Krupp tube-mills, and through settlers to a Brown air agitator, where a stronger solution is introduced. From the Brown agitator the pulp goes to Moore filter-presses, which are in duplicate, having a capacity of 150 tons each. Though the dividends from this Company have been ₱1,000,000 a year for the last 12 years, it is believed that the new mill will enable the Company to double these, and the stock, which is but ₱50 par, and has been selling for the last year at about ₱1800 per share, has now mounted to ₱2400. For the Union mill has also been ordered a Moore filter-plant of 150-ton capacity, which in treatment will be exactly the same as the San Rafael, the ores being practically identical. At the Cia. Beneficiadora de Metales de Pachuca, though immense Chilean mills are still in use, with concentrators, the Moore

filter has been added. Much of the improvement at Pachuca has been made possible by the introduction of electricity, and the cheapening of power, which has resulted in an increased production, so that with all the additions to the mills of the camp Pachuca still lacks mill-capacity. The needs will be even greater in the coming year with the new work that is in progress. Pachuca, though but two hours by rail from Mexico City, is not heralded in the newspapers as many of the other centres of the Republic, but it possesses more old dividend-payers than any. The Santa Gertrudis has paid big dividends for 30 years, and millions are distributed yearly by the San Raphael, Soledad, Sorpresa, Maravilla, Real del Monte, and La Blanca. It is again stated that New York capitalists are after an option on this mine from Francis Rule for ₱10,000,000. At Zacualpam, one of the interior camps of the State of Hidalgo, the Seguranza Mining Co., operating the old Corona property, has placed a contract through its president, George A. Waddell, of San Luis Potosí, for the



Map of Southwestern Chihuahua.

erection of a 200-ton concentrating and cyanide mill.

In Guerrero the Maine & Nebraska Mining Co. is building two miles of railroad from Balsas to the Santa Lucia mine, where it is stated 250,000 tons of ore have been blocked out. It is proposed to erect a 100-ton smelter early next year. The Guerrero Mining Co., also operating near Balsas, under the management of T. E. Ritnour, is preparing to put in a 50-ton smelter. A 50-ton custom mill is being planned for the Real de Guadalupe. The Columna y Anexas, together with a 35-ton Chilean mill, concentrator, and cyanide plant, and the San Pedro y Anexas, have been consolidated with El Progreso under the name of El Progreso Mining Co., and systematic development will at once be inaugurated.

Another important merger has occurred at Cananea, Sonora. The Calumet & Sonora Copper Co. and the South Cananea Copper Co. have combined and will be known in future as the Duluth-Sonora Mining Co., with $3,000,000 capital, controlled in Duluth, Minnesota, with J. W. Norton as president. The Lucky Tiger, in Arizpe, made famous by the long fight for possession by its Kansas City owners, is said to be under option to New York capitalists for $6,500,000.

Mining in Chihuahua continues exceptionally flourishing considering prevailing prices of the metals, and while September showed no material improvement over the output for August, the production for the month of October so far promises to make it the banner month of the year. Increase in the output from small shippers is noteworthy. The reported sale of the Rio Tinto mines and smelter at Terrazas, about 25 miles north of Chihuahua, by Juan A. Creel and associates to Corrigan & McKinney, of Cleveland, Ohio, has been confirmed, and the new owners have already given orders for alterations and additions necessary to increase the capacity of the smelter to 300 tons. For the economical handling of the ores a tunnel has been started to cut through a small mountain between the smelter and the mines, so that the ores may be taken directly from the mines to the smelter by a light Porter engine. The development of the San Rafael, in the same camp by the same people, continues with encouraging results, and large bodies of lead carbonate are being developed. In Santa Eulalia the American Smelting & Refining Co. is increasing its shipments, as is also the Buena Tierra of the Santa Eulalia Exploration Co., and the first named is putting in the tramway which arrived October 1 in six carloads from the Trenton Iron Works, of Trenton, New Jersey. This is to connect the A. S. & R. Co., mines with the railroad at Santa Eulalia, and may later be extended to the Company's Chihuahua plant. Henry Faivre continues shipments of several carloads per month of 50% zinc ore from the Coyame district, east of Chihuahua. The Chihuahua Copper Mining Co. is sending two carloads per week of 10 to 15% copper ore from Falomir to the Aguascalientes plant. From west of Chihuahua the Dolores Mines Co., the Republica, and the Rio de Plata are each sending about a carload per week, which net them ₱25,000 per car. The Calera Mining Co. continues steadily shipping a carload per week each of clean galena and clean zinc-blende. Shipments of silver and gold bullion from the western part of the State through the city of Chihuahua to New York are nearly ₱500,000 per month. J. G. Stevenson is making cyanide tests at the Gavilana mines at San José del Sitio; J. J. Watterson is putting in a 25-ton reverberatory furnace at Uruachic; S. L. Pearce is buying machinery for a mill at Chinipas; the International Gold Mines Co., of Kansas City, is said to have purchased for $200,000 from J. W. Pender the Socorro mines in the Rayon district, near Ocampo; and Bert Peterson, of Parral, has taken over a large group of claims at Los Lamentos, 50 miles east of Ahumada.

The Parral Consolidated Mines Co. has been organized with Philadelphia capital of ₱200,000 to operate La Prieta mine, with D. H. Bradley, Jr., as manager. Among other plans of the Company is the installation of a crusher, sampler, and belt ore-sorter. The Alvarado Consolidated Mines Co. has been re-organized in Boston, with a $10,000,000 capital, to work the Palmilla mine of Pedro Alvarado on the 15-year lease that was held by J. A. Coram. This lease has been turned over to the re-organized Company, of which A. J. McQuatters is president, and Juan A. Creel, of Chihuahua, and James I. Long, of Parral, are among the directors. An adit will be driven from the west side to connect with the main Palmilla shaft, which will reduce the expense of pumping about 60%. It is said that Alvarado has spent in pumps more than enough to have driven this adit. The shaft will be re-timbered and as soon as practicable a 1000-ton mill will be erected at the mouth of the adit.

SALT LAKE, UTAH.

Consolidated Mercur Report. — Mines in Gold Mountain District. — Mining Deals at Tintic.

Consolidated Mercur is the principal exclusive gold mine now active in the State of Utah. Next in importance are the Jennie, at Gold Springs, Iron county; the Annie Laurie, at Kimberly, Piute county, in what is known as the Gold mountain district. In the same region is the Sevier Consolidated, to which I referred in another letter as being a

good example of how a mine possessing merit may be ruined by incompetents. In this instance the property fell into the hands of persons who had had no previous experience in mining. They thought they knew enough to get along without employing a mining engineer to guide them; only to find out too late how serious a mistake they had made. The president of the corporation was formerly an employee of standing at Washington, and it was through him nearly $200,000 was raised for the purchase of the property, equipment, and development. After a time, the management was given to a minister of the Gospel, who forsook the pulpit to espouse the cause of mining. Only one result could be expected—the mine is now held by its creditors. But Consolidated Mercur is unlike the others, in that its ores contain nothing but gold; in the others the gold is invariably associated with silver. From the annual report issued recently by the Consolidated Mercur company, it is ascertained that the ore treated in the mill during the fiscal year ending on June 30 last, averaged $3.77 per ton; that 92c. of this went into the tailing, leaving an extraction of $2.85 per ton. A total of 226,229 tons was treated, of which there was 87,492 tons of base and 138,737 of oxidized ore. The slime-plant, installed last year at a cost of between $25,000 and $30,000, did not come up to expectations as far as the treatment of base ore is concerned; but the result obtained with oxidized ore was quite satisfactory. The total receipts of the Company, which include $644,353 from the sale of gold bullion, were $659,941. The net operating expenses were $657,504, leaving net earnings for the year of $2,436. Large expenditure was made in the development of new resources in the Brickyard mine, and in the re-opening of the old stopes in the Golden Gate mine, leaving a condition favorable for profit-making in the future.

Two mining deals have been consummated during the past fortnight involving property in the Tintic district. Control of the Carisa mine has passed to C. E. Loose, of Provo, Utah, and associates, and the Opex group in the same district to Jesse Knight, of Provo, and associates. The Opex Consolidated Mines Co. has been formed to operate the latter, which is to be under the management of Frank P. Swindler, of Salt Lake.

The Tintic Smelting Co. will resume operation with one lead furnace within a week. Owing to inefficient power facilities the plant was recently closed, but the deficiencies have since been remedied.

A new hoisting plant has been installed at the Utah-United Mines Co.'s property in Beaver county and a vigorous development campaign has been planned. The Utah-United corporation was formed recently as a result of a consolidation of the Skylark and Wasatch mines.

BUTTE, MONTANA.

British Butte Mammoth Gold Dredge.— North Butte Extension Re-organization.—Anti-Wildcat Association.—Smelter at Cook City.

The big gold dredge, one of the largest in the world, which is being built a few miles west of Butte by the British-Butte Mining Co., is assuming shape rapidly. People are beginning to wonder if they really had been overlooking a bonanza right at the doors of Butte only to permit a lot of Londoners to pick it up without a protest. The British-Butte Co. owns about 1000 acres of placer ground in the vicinity of Rocker, five miles west of Butte. In the pioneer days of mining considerable placer gold was taken out of the ground there, along what is known as Silver Bow creek. A false bedrock was reached and mining stopped. The British-Butte Co. has sunk a shaft through the false bedrock to a depth of 650 ft. From the bottom of the shaft a bore was made to a depth of 1000 ft. from the surface, and yet the true bedrock has not been found. Through every foot of the shaft and bore it is said that gold has been found, and the fabulous yield of 33 to 50c. per cubic yard is reported all the way down. The dredge has a guaranteed capacity of 2500 yd. per day.

The stockholders of the Butte-Radersburg Mining Co., at their annual meeting, elected the following directors: F. H. Symons, Charles D. Horton, E. R. Dornblut, E. E. German, M. J. McEvans, Michael Morley, and L. E. Symons. F. H. Symons is president, M. J. McEvans vice president, H. A. Newcomb secretary, and L. E. Symons treasurer. The property is situated near Radersburg, Montana, and some devolepment work has been done on it. The showing in gold and silver is said to be encouraging.

Butte shareholders of the North Butte Extension Copper Mining Co. are in receipt of notice from the re-organization committee, which was appointed at a meeting of directors in New York recently, concerning the plans to revive the Company. The committee is composed of George N. Orcutt, general attorney for the Erie railroad; R. J. Horner, of Horner & Co., of New York; Charles H. Moore, A. M. Andrews, and J. O. Morris, of Chicago. It is proposed to organize a new company under the laws of Maine, to be called the North Butte Extension Development Co., with a capitalization of $1,500,000, divided into 1,500,000 shares. It is purposed to exchange the new stock for the old, share for share, upon payment of 50c. as an assessment. It is proposed to use the first $50,000 received to pay off pressing obligations and then to advance money as required to meet other debts and provide a working fund. It is stated in the subscription agreement that "certain claimants and creditors" of the North Butte Extension Copper Mining Co., whose identity is not disclosed, have agreed with the committee to exchange their indebtedness and claims owing them, amounting to $75,000, for 150,000 shares of stock of the new corporation. It is also provided that the portion of the 1,000,000 shares of stock to be issued that are not taken by stockholders, and the 500,000 shares that are not to be issued, shall all remain in the treasury of the new corporation as treasury stock, to provide for the future needs of the Company.

Mining men of Montana and other States in the Northwest have inaugurated a movement for the organization of an association, the purpose of which is to inject a little more honor into the business and to discourage frauds and 'wildcatting.' Each member of the organization is required to "pledge his honor as a man that he will so conduct himself in relation to the business of mining as not to reflect unfavorably on mining as an industry, and that he will not knowingly engage in any practice that will bring reproach upon the association." It is proposed to include in the association Montana, Idaho, Washington, Oregon, Alberta, British Columbia, and Alaska. With a large membership it is believed that more can be accomplished in behalf of the mining industry than has been through any other organization. The association will be given considerable aid in its purpose to prevent fraud in mining enterprises by the coming legislative assembly of Montana, as many plans are being discussed by which laws may be made to reach the crook in mining promotion. The Butte district has suffered severely during the past two years from fraudulent mine promotions, and through failures of companies resulting from criminal recklessness and dishonesty.

Preparations are being made for the erection of a 200-ton copper smelter in the New World mining district near Cook City. Sufficient money for the enterprise has been subscribed, and the machinery has been hauled to the ground. The smelter will be near the Scotch Bonnet property that will furnish most of the ore to be treated in the new plant.

The Baltimore Copper Mining Co. has made the final payment on the Baltimore claims near Boulder. The property has been partly developed by means of five adits, having an aggregate length of 1800 ft., and by a shaft and cross-cut. The ore assays well in silver, copper, and lead, and a considerable tonnage is claimed to be in sight.

It is reported that the re-organizers of the Davis-Daly Co. have become entitled to about 60,000 shares of stock by reason of the fact that stockholders of the old Company did not offer their shares for exchange together with the first payment of the $2 assessment levied.

JOHANNESBURG, TRANSVAAL.

Cheerful Outlook.—Nine New Mills.— Rhodesian Progress. — Community of Prospectors. — More Heavy Stamps. — A Natal State Mill.—Central Electric Station.

No report dealing with technical matters upon the Rand today should omit reference to the improved financial position and to the strength, gained rapidly after two or three years of increasing depression, maintained in the Kaffir share-market. Many projects of expansion have been held over for 'better times,' but the 'better times' have been delayed first by labor difficulties and then by the disfavor in which all South African enterprises were held for a while among investors. It is difficult for men in other parts of the world to realize how keen was the depression upon the Rand during that period of exceptional industrial activity which marked the progress of mining elsewhere up to the autumn of last year. Now, however, there has been a manifest return of confidence. The deplorable elements of a boom are fortunately lacking. Few new stock-issues are being thrown upon the market. Old established companies, controlled by the big and most reputable mining houses, are the leading favorites. Many stocks have advanced in price 20 to 40% in the last few weeks, several purely on account of the general buoyancy of the market; others in view of actual improvements from development. Revival of interest in Rand finance will naturally hasten the schemes of mining expansion resolved upon by numerous interests. But, even part from the influence of the market improvement, the promise of increase in the gold output during the next few months is assured. According to Government returns, there were 8500 stamps and 86 tube-mills at work in July, treating 1,527,000 tons for a yield of 561,703 fine ounces, worth £2,385,962. New mills which have started crushing but have not yet declared their yields (owing to the allowance of gold necessary for setting the plates and for the zinc-boxes) include those of the Simmer Deep-Jupiter, West Rand Consolidated, and Aurora West; those erected and to commence work shortly, include the Gedould, Knight Central, Main Reef West, and Cinderella Deep. These plants comprise 720 stamps and tube-mills, and should swell the monthly tonnage of ore milled by about 160,000 tons. In addition to these, there are new plants and extensions under design or construction amounting to 175 stamps, plus tube-mills. A dozen or more mines are erecting additional tube-mills to increase stamp-duties and extraction. Moreover, if the financial situation continues favorable, and Sir J. B. Robinson is able to raise the funds for carrying out his long-formulated policy in the West Rand, the Randfontein group of mines will next year see under way the erection of batteries totaling 800 stamps and 30 tube-mills, upon subsidiary mines at present not producing.

The large influx of miners, prospectors, and small capitalists to Southern Rhodesia during the last year would be an affair of much over-rated importance if unattended by tangible results in the shape of increasing output. Fortunately, the stimulus provided to mineral development by favorable laws and open prospecting is being reflected in a steady advance in production. The figures for the first seven months of this year compare satisfactorily with previous returns, as shown by the following records for Southern Rhodesia:

Year.		Gold Yield.
1906		£1,985,101
1907		2,178,885
1908—January	£199,880	
February	191,635	
March	200,615	
April	212,935	
May	223,867	
June	224,920	
July	228,151	
		1,482,003

The rate of gold production may now be placed at about two and three quarters millions sterling per annum. In addition to gold, a yield worth £79,000 for the seven months is attributed to other mineral products, including, silver, lead, copper, chrome-iron, diamonds, coal, and a few tons of asbestos. The July declaration of mineral output was a record for the territory.

Considerable interest has been evinced locally by the publication in the *South African Mining Journal* of quotations from T. F. Van Wagenen's article in the MINING AND SCIENTIFIC PRESS, in which he pointed out the direct influence of liberal laws upon the existence of a body of good prospectors in a country. It has often been declared by the representatives of the ultra-conservative Dutch farmers that the policy of 'open prospecting' would, if instituted, be futile, owing to the absence of suitable unbiased authority, pointing out forcibly that a sound community of prospectors soon springs up when given a 'square deal.' This expression of opinion by Mr. Van Wagenen proves welcome since the views of our public men are commonly influenced by the bias of party politics.

Just as tube-mills constituted the most significant factor in the progressive changes marking Rand metallurgy in 1905 and 1906, heavy stamps are the most conspicuous innovation of today. Excepting one or two mining groups, that are notoriously slow in adopting new technical policies, all the Rand corporations are equipping their new plants with stamps of a weight far in excess of the maximum of a few years ago. A battery destined to shortly commence work (upon ore hoisted from 4000 ft.) is that of the Cindereila Deep. This mine has obtained special permission to stope and mill on a moderate basis through its single shaft; its workings being at present unconnected with any others, the Government could only suspend its regulations to a certain degree. However, it is estimated that 12,000 tons per month can be dealt with under existing conditions. The 50-stamp mill at this mine (to be extended to 100 and then to 200 heads when practicable) will be electrically driven, each unit of 20 stamps being served by a separate motor, as compared with the 10-stamp units of the new Simmer Deep plant. The weight of stamps will be 1700 lb., and these being aided by two small tube-mills, the anticipated stamp-duty of 8 tons per stamp per diem should be well maintained.

The earnest wish of the Natal Government to aid the development of metalliferous mining in the Colony (whose mineral yield is almost negligible, with the exception of coal) has long been practically evinced by grants for diamond-drill prospecting and offers of bonuses. Another step has been made in the right direction by the acquisition of a Tremain mill for the purpose of conducting test-crushing free of charge in promising gold-districts. This is certainly a small advance toward the policy of erecting State batteries of more or less permanence, as followed so extensively in Australia; if a comparison is to be established, however, it must be allowed that the finances of the Colony do not justify heavy expenditures, and the worth of its auriferous deposits has not been sufficiently demonstrated to encourage the risk of much public money. Consequently the Mines Department can as yet only lend aid to work of a purely exploratory nature. The regulations framed accordingly stipulate for the treatment of not more than 500 tons of any one deposit, and for the erection of the mill on not more than one site in the same locality, without exceptional cause. Claim-holders whose property is selected for operations will be called upon to provide a suitable site and water supply, which must be available for use in the treatment of ore from other workings.

A large party of members of local engineering societies visited the new power-plant of the Victoria Falls Power Co. at Brakpan (East Rand) last week. This is the first central station in which power will be generated by turbines in the Transvaal. The installation, designed for an output of 6000 kw., includes eight Babcock & Wilcox boilers; two turbines, built by the Allgemeine Elektricitäts-Gesellchaft, Berlin, coupled to three-phase generators of 3000-kw. capacity at 10,000 volt, and a power-factor of 0.8 running at 1500 revolutions.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Tin in the Lost River mine, Seward Peninsula, Alaska, occurs as cassiterite (tin oxide) in a greisen dike penetrating limestone, and with it is found an average content of 2% wolframite (tungstate of iron). Topaz is also a distinctive feature of the vein.

Volume decrease for tailing containing a moderate proportion of argillaceous material, upon drying from a saturated condition to the condition known as 'air dried,' is approximately 14%. Successive wetting and drying causes packing of the mass, resulting in a contraction which may amount to as much as 20% of the original volume.

The Bell-Krupp process of iron purification is a method invented by the late Sir I. Lowthian Bell to eliminate silicon and phosphorus from pig-iron. The liquid pig-iron is violently stirred up with iron oxide. The resulting silica and phosphoric acid are slagged off in from 7 to 10 minutes, the elimination of these impurities reaching 90%. The process is stopped as soon as the carbon begins to burn. The apparatus used is the revolving hearth of a mechanical puddling furnace. The metal so purified is used partly for the subsequent manufacture of crucible steel, and it is also employed in foundry practice.

Boulder blasting is best done by the method known as 'block-holing,' and 75% dynamite should be used. 'Mud-blasting' or 'sand-blasting,' also called 'bulldozing,' is exceedingly wasteful of explosive. This method depends upon the suddenness of the expansion from the detonation of the dynamite, and the only advantage of the mass of damp material placed over the cartridge laid on the surface of the boulder is to increase the area which is suddenly lifted, thereby increasing the resistance due to the inertia of the surrounding air. The force of the explosive is thus expended somewhat more effectively in overcoming the cohesion of the rock.

Shear, in geological parlance, expresses a form of cleavage in rocks resulting from a movement similar to that which would occur in a mass of rectangular outline if force were applied at one corner, altering its shape to that of a rhomb. Rocks so affected present a sheeted appearance. A region that has been subjected to shearing action usually shows a tendency to rotation around an axis, that is the shear-lines are curved, although this may often be recognized only on platting a survey of a large area. Within the sheared area lines of weakness in the rocks yield to complicated deformation, and are generally referred to as 'shear-zones.' These readily become places for the deposition of ores, partly because they are usually more permeable, and because the crushing and pectoidization of the minerals favor chemical interchange.

A claim located so as to include within the monumented area more ground than may be legally appropriated under the mining law, is liable to be curtailed by a subsequent location claiming part of the lode attempted to be covered by the prior claimant. Two remedies are possible in such a case, either to make an amended location accurately covering that part of the lode which is of the greater importance to the claimant, or by having the claim surveyed for patent by a Deputy Mineral Surveyor. In such a survey the full legal claim will be established within the monuments on the ground, and in the absence of conflicting claims the original locator may elect which portions of his claim, in excess of the legal area, shall be forfeited.

Permeability of concrete by water is greatly reduced by the addition of hydrated lime to the cement-mortar. The permeability is lowered to nearly nothing with 16% lime, a desirable mixture for this purpose being, cement 1 part, sand 3, stone 5, hydrated lime 1.5. The addition of lime, however, is generally regarded as tending to weaken the concrete, since free lime absorbs carbonic acid and gradually forms lime carbonate, accompanied by increase of volume, which would produce internal strains. Contradictory results have been reported in regard to the ultimate effect of using lime in cement-mortar. In recent tests made by the Boston Elevated Railway Co. it was shown that concrete 1:2:4, without lime, passed 74.8 grains water per hour through an 8-in. block at a pressure of 60 lb. per sq. in., while a similar mixture, plus 10% lime, passed only 1.6 grain under like conditions.

'Alkali' in soils consists of salts of lime, magnesia, potash, and soda. In 'white alkali' the salts are chiefly chlorides and sulphates, with some carbonates. 'Black alkali' consists almost wholly of sodium carbonate, but this may exist along with such quantities of other salts as to obscure its presence except on chemical test. The origin of alkali has not yet been satisfactorily explained. It is not due to a preponderance of the salts named in the rocks of the arid region. In humid countries leaching by rainwater removes such material, the carbonic acid in the water assisting to an important extent. The crystalline rocks contain chlorine and sulphur, the average content in these elements being respectively 0.07 and 0.108%. The hydrolizing action of water converts these into hydrochloric and sulphuric acids during the process of rock decomposition, and the corresponding salts are formed at once from the bases present in the constituent rock-forming minerals. During the prolonged seasons of drought capillarity brings salts from great depths to the surface, where they are left by evaporation. Many complicated chemical reactions and some remarkable physico-chemical phenomena, take part in the process. From the above it is seen that it is the aridity rather than a peculiarity of rock-composition which causes the accumulation of alkali in soils.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Shasta County as a Smelting Centre.

The Editor:

Sir—Shasta county, California, after having had a set-back in the smelting business by the farmers who were anxious to sell their land by means of damage suits against the smelters, on account of the smoke, now realizes the value of the smelters to itself and to the State. The majority of the people are in favor of encouraging the industry, even with some inconvenience to themselves, as the closing down of the Mountain Copper Co.'s plant at Keswick checked the business industries of the county much more than they anticipated. Since then, the Mammoth Copper Co.'s smelter, built during 1905, got fairly under way in 1906, and continued to increase its capacity until it reached a production of 3,500,000 lb. copper in May last, or at the rate of over $5,000,000 per annum, the ore smelted containing some gold and silver. Last June the Company was smelting at the rate of 1300 tons of local sulphides and 350 tons silicious ore. The silicious ore comes mostly from the Company's own mines in Utah and Nevada.

Great Western Gold Co.'s Smelter, Ingot, California.

The Balaklala Con. Copper Co. expects to start the smelter at Coram this month, with a daily capacity of 1200 tons. The Bully Hill Copper M. & S. Co.'s smelter was blown in again last March with one furnace, although I understand they have two, with a daily capacity of not less than 600 tons. This plant had remained idle for more than two years while developing the mining properties and constructing a standard-gauge railroad from the main line of the Southern Pacific to the smelter, at a cost of about $500,000. The Bully Hill ore averages richer than that of the three companies first named, on account of the ore containing more silver and gold. The mines are on the east side of the Sacramento river, not far from the Great Western Gold Co.'s properties (generally known as the Afterthought group), in apparently the same formation as the mines of the three first-mentioned groups. An igneous rock lies below the ore, with a sedimentary capping.

I particularly wish to draw attention to the necessity for more railroads for Shasta county and northern California. Three years ago, when I first came to Redding, the town claimed to be the fourth largest shipping centre in the State. Since then the Mammoth smelting works have been started, and have been operated continuously; the Great Western Gold Co.'s smelter was in operation every year during the dry season, but found it impossible to operate during the wet or winter season, on account of being situated 13 miles off the nearest railroad. Few people realize the freight business that one smelter will create. To illustrate, consider the case of the Mammoth. It requires 20 cars daily of 50,000 lb. capacity to bring in its silicious ore and coke and to send out its copper bullion. In addition to this there are supplies and machinery for the mines, and a business community built up by the employment of 1000 to 1200 men with their families.

Logging Road, Shasta County, California.

The Redding, Afterthought & Northeastern Railway Co. has been organized to continue a road, first from Bella Vista to the Great Western Gold Co.'s smelter at Ingot (Bella Vista being already connected by a standard-gauge railroad with the main line of the Southern Pacific) and then, as

rapidly as possible, to extend the road farther to the northeast. At Ingot the railroad will get the business of the Great Western Gold Co., that is, blast furnace coke, silicious ore, and supplies. Outward the freight will consist of copper matte and selected zinc ore, too rich in zinc to justify sacrificing it in the blast furnace. While Ingot is the terminus of the railroad, the Terry Lumber Co. intends to make that station the lower end of its flume to load lumber onto the cars, instead of using Bella Vista, as at present. J. E. Terry claims that they could, if necessary, ship 20,000,000 ft. of lumber per year. In addition to the Terry Lumber Co., several other smaller lumber companies, with sawmills, are anxiously waiting for the railroad to shorten their haul on lumber, which they are now delivering by wagon. The road should be completed as soon as possible through the northeastern portion of California, and ultimately into southeastern Oregon and southwestern Idaho. By extending the road 15 to 25 miles above Ingot, it would tap the best lumber region, with an estimate of 2,000,000,000 to 4,000,000,000 ft. of standing timber. This would give the agricultural valleys tributary to such a point a chance to market their products profitably.

It seems that Shasta county as a custom smelting centre has been overlooked by the American Smelting & Refining Co., for even when the Guggenheims had control of the Balakala smelter their idea seemed to be to have their large custom works at San Bruno, near San Francisco. I suggest Shasta county for many reasons: one is the advantage of being close to a supply of basic ore. In fact smelters on San Francisco bay are now compelled to either smelt nearly barren quartz, mined locally, or ship in silicious ore from Nevada and Utah. Redding is nearly as close to the mines of Nevada as is San Francisco. The Southern Pacific is now making the same rates on ore from Nevada to Shasta county smelters that they charge to San Francisco points. The damages from smelter smoke can be settled much more cheaply in Shasta county than in any other suitable centre in California.

I would not advise the erection of a smelter close to Redding, or anywhere south of it, on account of the fruit farmers. Up the Sacramento river, near Kennett or Coram (Keswick is too close to Redding), would be an excellent situation for a custom smelter, if competitive railroads had room to connect with the smelters without too great an expense. When the Redding, Afterthought & Northeastern railroad is completed in connection with the Terry Lumber Co.'s railroad, from Anderson to the Great Western Gold Co.'s smelter at Ingot, an excellent situation can, no doubt, be selected somewhere along that line where there are only a few ranches of small value which could be purchased above and below the smelter for several miles along the railroad.

The Redding, Afterthought & Northeastern railroad will no doubt be intersected east of Anderson by the electric railroad coming in from the south, and the Western Pacific from the southeast, in the near future. With such connections for California and Nevada at hand, the extension of the Redding, Afterthought & Northeastern railroad through the northeastern corner of California, southeastern part of Oregon and into Idaho would develop those regions and make a connecting link for the transportation of the ores of Idaho. The main-line railroads running north and south between Montana and Utah would not only be a good connection for the railroad, but would make another important feeder for a custom smelter such as the Guggenheims had in view for the coast.

Either San Francisco or Shasta county, California, are points much closer to the principal gold and silver mines of Nevada than Utah smelting points. It is true that Shasta county is back from the coast, but it is not far from where the Sacramento river becomes navigable. The low-grade ore-supply will naturally come from northern California, and mostly from Shasta county, where large orebodies are now developed.

S. E. Bretherton.

San Francisco, October 10.

Dredging Possibilities in Sonora.

The Editor:

Sir—Replying to your editorial comment on my article on 'Dry Placers of Sonora,' I would say, that the problem of finding water for mining operations in the Altar district of that State is chiefly one of discovering subterranean reservoirs or buried valleys of adequate size, in which water is protected by a mass of sand or gravel from the intense evaporative power of the dry atmosphere of the Sonoran desert. Many such reservoirs are known and some have been tapped, but only on a small scale to supply water for a stamp-mill or a small battery of Huntington mills.

In some cases the mines are far from the reservoirs, and then the expense of several miles of pipeline must be met. The Magdalena and Altar rivers and their tributaries carry in their underflow large quantities of water, and this was utilized to supply the stamp-mill of the Llanos de Oro enterprise. It seems doubtful whether water could be pumped long distances from these gravel reservoirs cheaply enough for hydraulicking, but there is no doubt that some of these placers will in the near future be exploited with dredges supplied with water from these subterranean sources. In the present lack of exact information it is difficult to form any reliable estimate of expense, but, in the writer's judgment, the possibility undoubtedly exists of operating placers with water at some points in Altar.

F. J. H. Merrill.

New York, October 5.

Cornish Pumps.

The Editor:

Sir—My belief that the prejudice existing against Cornish pumps is due in great measure to ignorance concerning them, is intensified by the letter on the subject apearing in your issue of August 1. Fortunately, the writer of that letter states that his experience with Cornish pumps has been confined to an

occasional glimpse of one at some abandoned mine. This being so, it would probably have been wiser had he not proceeded to explain their working in an incorrect manner. It was wrong to base beliefs on these assumptions, and to conclude with a comparison of the maligned Cornish pump and the direct-acting steam-pump.

He states that the best results are obtained from Cornish pumps in perpendicular shafts where there is a permanent pumping-level. Just the contrary is the case, the Cornish pump being particularly suited for continuous sinking, and I had endeavored to emphasize this point in my previous letter, published July 11, by stating that pumps installed half a century ago, when it was expected to work the mines to no greater depth than from 600 to 800 ft., are today doing good duty to depths of nearly 2000 ft. I also hoped I had shown that Cornish pumps were exceedingly well adapted to handling sudden increases in the quantity of water, up to their maximum capacity. They have a large range of capacity, and will work economically from one-third up to full capacity by simply increasing the number of strokes. I also indicated how easy it was to increase the size of the poles when necessary to increase the capacity.

Your correspondent appears to think that the steam acts directly on the pump-rod, and by forcing it down raises the water. I must apologize for not having explained in my previous letter the *modus operandi* of the Cornish pump, and my excuse must be that I imagined that everyone interested in mine pumps was conversant with this elementary principle. I can imagine that it is owing to ignorance that so many people advocate the addition of a crank and fly-wheel to a Cornish pump. In the ordinary Cornish pumping engine, high-pressure steam is admitted to the top end of the inverted cylinder, and, assisted by a partial vacuum on the other side of the piston, forces this down, and with it the indoor end of the beam, thus raising the pump-rods and poles and drawing the water from the several cisterns into the pole-cases. A great part of the weight of this system is balanced by means of one or more balance-bobs. As soon as the piston has reached the bottom of its stroke, the engaging of a tappet opens the equilibrium valve, which has the effect of turning the exhaust steam from the upper end of the cylinder into the lower end, the result being that the steam-pressure is the same on both sides of the piston. The return stroke then commences, the weight of the rods forcing the poles into their cases and so raises the water in the main column.

After the return or outdoor stroke is completed, the lower end of the steam cylinder is placed in communication with the condenser, where a vacuum is formed. It will thus be seen that high-pressure steam plays no part in the pumping stroke of the engine, and for this reason the velocity of the rods on this stroke is practically the same, no matter how many strokes per minute the pump may be making. The speed of the pump, that is, the number of strokes per minute, is governed by the duration of the pauses at the end of each stroke. This is the crux of the whole system, and is the cause of the invariable failure of the crank and fly-wheel when applied to the Cornish pumping-engines. These pauses are governed by the action of the cataract valve, or in the more modern engines by the Davey differential valve, a most ingenious device, which I cannot attempt to describe.

It should be evident, therefore, that a Cornish pumping-engine operates with a variable speed indoor stroke, depending for its speed on the point of cut-off of the steam in the cylinder, and a constant and comparatively fast outdoor stroke, with pauses of the required length between these strokes. No arrangement of cranks and fly-wheels will allow of this service, and the application of air vessels and other fakes in the endeavor to make them do so, is only to aggravate the error. Again, pumping by means of plungers is a reciprocating action, and so is that of the piston in the steam cylinder. Why introduce a rotary device between the two in a system of pumping that distinctly calls for pauses for its correct working?

Compound steam cylinders are frequently applied to the Cornish engines. Messrs. Hathorn, Davey & Co. have made a specialty of this practice, but it is doubtful whether greater economy in fuel-consumption results. For those who object to the overhead beam, and for very large plants it is no doubt objectionable; it is quite easy to have the cylinders placed tandem and horizontal, the piston-rod being connected directly to an angle-bob, which in turn operates the pump-rods. This system has lately been applied to one of the largest deep-pumping installations in existence, in a gold mine in Tasmania.

I regret that I know nothing of the high-duty, compound-engine, rope-drive connection to a gear-train and crank-shaft connected to Cornish plunger-pumps, as mentioned by another correspondent. It certainly sounds modern, and may be reliable and efficient. I should be glad to hear more about it, after it has been in operation long enough to demonstrate its value.

ERNEST R. WOAKES.

Linares, Spain, September 15.

Protective coating for cyanide vats which may be relied on, according to W. H. Gaze, is made by heating 80 lb. of tar in a water bath at 160° F. until all the water is evaporated, and then adding, with constant stirring, 80 lb. of natural cement, that is, hydraulic lime. The mixture should remain thin and fluid. Heat, and apply hot. No quicklime should be used. This varnish is acid-resisting and flexible. A good coating for wood vats is made of benzol, 3 parts; wax, 1 part; dammar or kauri gum, 2 parts. Paraffin may replace beeswax with advantage. Dissolve the dammar and wax in the benzol, and apply like a varnish. To close leaks in iron tanks, make a saturated solution of asphaltum in turpentine. Apply hot to the dry iron. Give three or four coats.

The yield of rubber per acre in the Malay States during 1907 averaged 130 lb., the extremes being 188 and 90.

BROMO-CYANIDING OF GOLD ORES.

By E. W. Nardin.

*Although the bromo-cyanide or Diehl process for the extraction of gold from its ores is used at several of the Kalgoorlie mines, little information has been published on the original process, and no details are available from the various mines now using it. The following description of the process as carried on at the Hannan's Star plant, where several modifications were introduced by myself, will therefore be of interest. The process was first installed at the Hannan's Star mine, where a full working plant was erected by the London-Hamburg Co. In the contract 91% extraction on a sulphide ore of 15 dwt. value was guaranteed. This was considered a high extraction at the time, and the plant successfully fulfilled the promise made. The new features in the process were the finer grinding of the ore, for which purpose the tube-mill was introduced, and the addition of a solution of bromo-cyanide to the vats under ordinary cyanide treatment, whereby a higher extraction was obtained in a shorter time. The main difficulty in the process was in the manufacture of the bromo-cyanide solution, which was eventually overcome. The mixed salts now supplied by the London-Hamburg Co. are satisfactory, and are furnished at such a price that the process compares favorably with any other in point of cost.

Most of the Hannan's Star ore which has been treated by the process was low-grade, and hence the extraction is low, but the average value of the tailing for 1904 and 1905 was 1 dwt. 2 gr. and 1 dwt., respectively, which must be considered good work. On high-grade ore the process was equally successful. About 15,000 tons from the Brown Hill Extended mine, averaging 4 oz. gold per ton, and containing telluride, were treated by O. B. Ward in 1903, giving an average extraction of 95%. At Hannan's Star the average cost of bromo-cyanide treatment, extending over a period of 12 months (September, 1904, to October, 1905), was 9.75 pence per ton of ore treated, and the extraction was entirely satisfactory. On the same class of ore (sulphide), roasting would cost about 2s. 9d. per ton, so there is a balance of 2s. per ton in favor of the chemical, and the saving of the heavy first cost in furnace plant. In places where fuel and furnace supplies were more expensive, the chemical process would show a much more decided advantage. The process requires more metallurgical skill and constant attention to the progress of each vat under treatment; but, if this is available, the results are highly satisfactory, and the process has definite claim to be a cheap and efficient method of treatment for such ores as the Kalgoorlie sulpho-tellurides.

When I took charge of the Hannan's Star plant in July, 1904, the process was as follows: The ore from the rock-breaker was dry-crushed in two No. 5 Krupp ball-mills, with steel-wire screens of 27 mesh. From the mills it passed over amalgamated plates to a mixer, and then to a classifier at the end of the tube-mill. Here a separation was made, the overflow going to the slime-pumps, and the underflow into the tube-mill. The discharge from the mill was elevated to the classifier, where separation of the insufficiently ground portion was again affected. The slime-pumps delivered to two sets of spitzluten, the underflow from which passed back to the tube-mill, and the overflow to the pointed settling-boxes, where the pulp was thickened before passing to the agitator-vats. The point aimed at was to slime the whole of the ore to pass a 150-mesh sieve. In practice about 5% would remain on the 150-mesh sieve, but the whole of it would pass the 100-mesh sieve. There were four agitator-vats of 50 tons dry-ore capacity each. These each took on an average 16 hours to fill, representing 75 tons per day through the ball-mills. The tonnage was determined, for working purposes, by weighing the contents of a bottle, filled to its containing mark by dipping into the vat, and by measuring the volume of pulp in the vat. From the volume, tonnage, and specific gravity, the dry weight of ore was obtained. A mechanical sampler was arranged between the ball-mills and the mixer, which cut out a definite quantity periodically. This bulk-sample was quartered down, which gave the ore-sample for the day. A vat when full was given its charge of KCy, and three hours afterward a 'dip' KCy residue was taken, and the charge of BrCy solution added. After a total agitation of 20 hr. a quantity of lime was added, and the vat-charge 'pressed.' The quantity of BrCy added was varied according to the residue of preceding vats, and the value of the ore being treated as shown by the daily ore-sample. Every sixth frame in a filter-press was sampled, and the bulk-sample from the whole vat was quartered down to represent the final residue of that vat. The KCy residue was washed on a small vacuum-filter and assayed, while the final residue was assayed after drying. From the daily ore-samples, KCy, and final residue, the total extraction, and extraction by plain KCy, and by BrCy, were determined.

The bromo-cyanide solution is made according to the following equation:

$$(1)\quad 2KBr + KBrO_3 + 3KCy + 3H_2SO_4 = 3BrCy + 3K_2SO_4 + 3H_2O.$$

Its action in the treatment vat is supposed to be as follows:

$$(2)\quad BrCy + 3KCy + 2Au = 2KAuCy_2 + KBr.$$

The first two quantities in equation 1 are contained in the mixed salts supplied by the London-Hamburg Co., having about 40 to 44% Br as KBr, and 20 to 22% Br as $KBrO_3$; the proportion of Br as bromide being about twice that of Br as bromate. A 30-lb. charge is usually made up, and for this the following weights are taken:

	Lb.
H_2SO_4	50.0
KCy	20.0
Mixed salts	36.8

The KCy is 93%, and the H_2SO_4 63% (chamber acid) strength. The solution is made in a closed wooden vessel, stirred by rotating arms, holding about 200 gal. In making up a charge, a portion of the water and all the H_2SO_4 are first mixed, and allowed to

*Paper in Trans. Australasian Inst. M. E., Vol. XII, 1907.

cool to normal temperature. The KCy, which is dissolved in a separate vessel in sufficient water to fill the mixing vessel, is then run in, and at the same time the proper weight of 'mixed salts' is gradually added. The whole is then agitated for 6 hr. before being used, and in a closed vessel it will retain its strength for some days. The cost of a 30-lb. charge of BrCy is about £4 10s., made up as follows: 50 lb. H_2SO_4 at 2d., 20 lb. KCy at 8.37d., 36.8 lb. salts at 1s. 10d. From each charge mixed, a dip-sample is taken and tested with a standard $Na_2S_2O_3$ solution, using potassium iodide as an indicator.

(3) $BrCy + 2KI = KBr + KCy + I_2$
(106) (254)

(4) $2Na_2S_2O_3 + 2I = 2NaI + Na_2S_4O_6$
(316) (254)

Thus BrCy corresponds to $2Na_2S_2O_3$.

The standard solution is made so that 1 c.c. contains 0.02 BrCy, and for this about 93.6 gm. of ordinary photographic crystals, $Na_2S_2O_3.5H_2O$, are dissolved in one litre of water.
(248)

A solution of copper sulphate is used for standardizing the above.

(5) $2CuSO_4 + 4KI = Cu_2I_2 + 2K_2SO_4 + I_2$
(126.8) (254)

126.8 Cu liberates 254 I, so that it corresponds to 106 BrCy and 496 $Na_2S_2O_3.5H_2O$. The solution is made by dissolving one gram of pure copper foil in acid, converting to sulphate, and dissolving in 100 c.c. water. Hence 10 c.c. contains 0.1 gm. Cu, equivalent to 0.0836 BrCy; then 1 c.c. hypo solution corresponds to 0.02 gm. BrCy, and 4.18 hypo solution to 0.0836 gm. BrCy.

In testing BrCy solutions, 5 c.c. are usually taken, Na_2CO_3 solution is added till alkaline, and then acetic acid till acid. A few crystals of KI, and some starch solution, are then added, and the whole titrated with the standard $Na_2S_2O_3$ solution.

Example: If 5 c.c. BrCy solution took 3.2 c.c. hypo, then

$$\frac{3.2 \times 0.0836}{4.18} \times 20 = 1.28\%$$

This method of testing BrCy solutions is different to that used at other mines, where it is customary to titrate direct with $Na_2S_2O_3$ without first neutralizing the H_2SO_4. The following is a series of tests made on a number of 30-lb. BrCy solutions by direct method, A, and, after neutralizing, B:

Charge.	Lb.	A. %	B. %
668	30	0.36	1.20
670	30	0.44	1.20
671	30	0.60	1.28
672	30	1.20	1.24
673	30	0.36	1.36
674	30	0.52	1.00

These show that by direct titration the test is usually low, and also that it gives irregular results, depending on the amount of free H_2SO_4 present. There seems to have been some doubt as to whether a BrCy solution increases in strength after, say, one hour's agitation, but tests which were made show that it does increase up to about 8 hr., from 0.56 to 1% BrCy. It was generally known that if the solution became too alkaline, either through a change in the ores, or the addition of too much lime either to the ore before crushing or after the bromo-cyanide treatment, the extraction by BrCy fell considerably, and for this reason an occasional test of the plant-solution was made for alkalinity, but not until several high tailing-discharges had been observed. Under the old system the KCy did not have sufficient time by itself: the gold in the ore and the KCy residue of each vat were not known, and the amount of BrCy that should be added was more or less a guess. When it is remembered that every 5 lb. of BrCy added to a 50-ton vat represents a cost of 4d. per ton of ore, that the action of the BrCy can be made just as effective after long KCy treatment, and that excess of BrCy gives no advantage, it will be seen how important it is that the value of the KCy tailing should be known after sufficient agitation (say 12 hr.), and the condition of the vat tested as to alkalinity before adding the BrCy. In any case, the action of the BrCy is of short duration, not exceeding 4 hr., so that if 20 hr. total agitation can be allowed, it is better to give 16 hr. with KCy, and then add the BrCy. It is preferable, however, to keep the vat under KCy treatment until the KCy residue is known, then correct the alkalinity, and add the BrCy. This could easily be done with extra vat-capacity. Total alkalinities are determined with standard solutions of HCl and NaHO, using phenolthalien as indicator. The following experiments were carried out to determine what was the most suitable degree of alkalinity for bromo-cyaniding.

Six sludge samples were taken at the same time from a vat which had had KCy treatment. The solution was filtered off one, and the quantity of a weak H_2SO_4 solution required to nearly neutralize it was determined. It took 40 c.c., so that to the sludge samples were added the following quantities of H_2SO_4 solution, respectively: to No. 1, 40 c.c.; to No. 2, 35 c.c.; to No. 3, 26 c.c.; to No. 4, 21 c.c.; to No. 5, 14 c.c.; to No. 6, 7 c.c.; to No. 7, *nil*. To each sample was also added 7 c.c. of BrCy solution, and the bottles were sealed and agitated for 8 hr. The solutions were then poured off and tested for alkalinity, while the residues were washed and assayed. The following were the results:

No.	Alkalinity, %	Value of Tailing, dwt.-gr.
1	0.0096	0 21
2	0.0128	0 21
3	0.0172	1 0
4	0.0262	1 0
5	0.0377	Lost
6	0.0595	1 3
7	0.0800	1 9

The KCy residue of the vat was 2 dwt., the final 'press' tailing 1 dwt. 9 gr., and the alkalinity of the solution from the KCy residue was 0.08%, and these are included as No. 7 in the above table. From these tests it will be seen that as the alkalinity was reduced so the residues fell in value in almost exact proportion; they prove conclusively that BrCy does not act well in a too alkaline solution, and that the

best action is obtained when the alkalinity is from 0.01% to nearly neutral.

A second series of tests, on a different grade of ore (assaying about 14 dwt.) was made. As in the previous case, varying quantities of H_2SO_4 and 7 c.c. of BrCy were added to the bottles, agitated for 12 hr., and the residues washed and assayed.

No.	Alkalinity, %	Value of Tailing, dwt.	gr.
1.—*Nil*	0.0134	1	9
2.—3 c.c. acid	0.0083	1	6
3.—6 c.c. acid	0.0064	1	0
4.—8 c.c. acid	Nearly neutral	1	0

The KCy residue in this vat was 4 dwt. 12 gr., and the final press tailing 1 dwt. 9 gr. It became the practice, therefore, to have the alkalinity of the vats during KCy treatment at between 0.02 and 0.03%, to keep the vat agitated until the value of the KCy residue was known, then correct the alkalinity to about 0.01% or less by H_2SO_4, and add BrCy, according to the assay value of the KCy residue. A better extraction was thus obtained, at less cost for BrCy, at the expense of a small amount of H_2SO_4 and extra agitation.

Owing to an insufficient number of vats, they could not always be kept back for the KCy residue, but on every occasion on which it was done a certainty could be made of the tailing being low and the consumption of BrCy a minimum. A number of experiments were carried out to explain this reduced action in an alkaline solution, but nothing definite was proved, although it is possibly due to the presence of KHO. If a solution of KHO be added to BrCy it is almost immediately destroyed. No smell of BrCy is left, and no test can be obtained with $Na_2S_2O_3$.

(6) $BrCy + 2KOH = KBr + KCyO + H_2O$.

Various experiments were carried out to determine the action of BrCy on FeS_2 and finely divided metallic Fe. The FeS_2 used was panned off from finely crushed ore, while metallic Fe was picked by a magnet from the sludge in a vat. Freshly prepared iron filings were also tried. Small quantities of these were agitated with a previously tested BrCy solution. Action at once began, and in a short time the BrCy was destroyed. All smell of BrCy disappeared, and no test could be obtained from $Na_2S_2O_3$. The result is a greenish-blue solution of a ferrous salt, from which a dark-green ferrous salt is precipitated by NH_4OH. These experiments showed that both FeS_2 and metallic Fe are bromo-cyanicides, that finely divided metallic Fe is the more active, and that there is sufficient of the latter produced in grinding the ore to destroy the amount of BrCy usually added to a vat. The BrCy seems to act more by breaking up the FeS_2 than by actual solution of the gold, but it is probable that a great portion of it is destroyed by the finely divided metallic Fe, without, of course, any beneficial result as far as setting free or dissolving gold is concerned.

Experiments were carried out to show the effect of adding ordinary commercial lime to vats after BrCy treatment, and it was found that a re-precipitation of gold took place to a small extent. To show this in a magnified way, two samples of solutions, A and B, were taken from a vat after BrCy treatment. Excess of lime was added to A, agitated a few hours, settled, decanted, and assayed, with the following result:

Solution A assayed 3 dwt. 21 gr. per ton;
Solution B assayed 5 dwt. 5 gr. per ton;

showing that the lime precipitated 1 dwt. 8 gr. of gold per ton from solution, or 25%. This is probably due to the presence of carbon or of occluded gases, such as hydrogen.

The results of these experiments have suggested certain improvements in bromo-cyaniding, some of which have been adopted, as follows:

1. The daily ore sample should be taken in the morning, and assayed as soon as possible, so as to know the value of the ore passing to the vats in the previous 24 hours.
2. The pulp should have a long KCy treatment.
3. A vat should be kept under KCy treatment till the value of the KCy residue is known.
4. The alkalinity of the vat should then be determined and corrected to 0.01% by H_2SO_4 before adding BrCy.
5. The quantity of BrCy added should then be determined from the value of the KCy residue, the tonnage of the vat, and so forth.
6. The lime added to the ore during crushing should be varied according to the alkalinity-test after KCy treatment, so that the plant-solution tests about 0.02 per cent.
7. Lime water should be made and added to the vats or to the solution from the presses, instead of adding lime to the vats.
8. Metallic iron should be kept out of the pulp as far as possible, as it is both a cyanicide and bromo-cyanicide.

Ordinary white alkali attacks and destroys cement concrete and probably some kinds of sandstone. The department of engineering and chemistry of the Montana State experiment station has arrived at this conclusion. This means that it is unsafe to use cement in any foundation or other structure coming in contact with soil in alkali regions unless some method is devised to protect it from the action of these salts. To devise some protection against this action of alkali on cement is the object of further investigation which the experiment station expects to carry on. The attention of the station was first called to this matter about a year ago by a letter from C. W. Swearingen, city engineer of Great Falls, to E. T. Tannatt, head of the engineering department of the station, asking him to investigate the cause of the disintegration of certain concrete sewers in Great Falls. Mr. Tannatt and Edmund Burke made a thorough investigation of the sewers referred to, and also of some concrete and sandstone foundations in the same city. These sewers, which had only been in a few years, were found to be in many places nearly destroyed by the action of the alkali in the soil surrounding them, and the sandstone foundation of the court house at Great Falls was found to be affected, both outside and inside. Similar action on cement has been noted in other places. Asphalt applied over the surface of the concrete affords a certain measure of protection.

DEEP LEAD MINING IN AUSTRALIA.

Written for the MINING AND SCIENTIFIC PRESS
By D. H. BROWNE.

"It was the Californian prospector, Hargreaves, who first publicly demonstrated the existence of gold in Australia. Actually the discovery by others seems to have occurred both in New South Wales and Victoria about the time of the rush to California in 1849. . . . Then, on April 3, 1851, Hargreaves appears on the scene and discovered the precious metal. The locality was near Bathurst. The news spread over the Colonies; a stampede to Bathurst and the adjacent districts occurred, to the distraction of pastoral settlers, and to the annoyance of the respectable government at Sydney."

The Rev. W. B. Clark, a geologist, gave excellent geological and political advice at the time in the columns of the *Sydney Morning Herald*. He sagaciously remarked that "the momentary effect of the gold mania may be to upset existing relations; but the effect will be a rapid increase of population and the Colony must prepare herself for an important growth in her influence upon the destinies of the World."

"Victoria was not long behind New South Wales in finding a goldfield, and it soon caused the older Colony to pale its ineffectual fires in the greater brilliance of the Victorian discoveries. James William Esmond was to Victoria what Hargreaves was to New South Wales. Esmond like Hargreaves had been at the Californian goldfields, and had an impression that the Australian soil was also auriferous. He left Port Phillip for California in June, 1849, observed that there were similarities in soil and general features between Clunes and California, and decided to return and explore his Australian home for gold. It chanced that Esmond and Hargreaves were fellow passengers from California to Sydney. Esmond found gold at Clunes, Victoria, on June 29, 1851. Gold was discovered at Ballarat, the native name for a 'resting place,' on August 25, 1851." Thus writes Withers in his 'History of Ballarat.' Victoria is the home of deep lead mining. It is interesting to trace what has been accomplished in developing this class of mining and the system successfully adopted to overcome the difficulties, which were so great that, in the light of our present knowledge, one can look back and admire the ability, judgment, and persistent effort displayed by the early pioneers, men of all nations, who in 50 years have built up a state of civilization of which every person in the country may well feel proud. When we consider that within four years of the discovery of gold at Ballarat, the miners on that field had traced the leads from the hills and flats, under the basaltic plateau, and that we find them putting down shafts through 400 ft. of hard rock, with the indomitable faith that gold would be found beneath; and then when 'wash-dirt' was struck, of which there was only a thin layer, with no drift between the basalt and the Silurian, we find them sinking a shaft through blasting ground and erecting machinery and installing pumps to cope with the water in the basalt, and stubbornly fighting their way to bedrock, and some of the best pay-dirt ever seen, it is marvellous how these men adapted themselves to their surroundings. By the year 1865, steam haulage, pumping, and treatment plants which were remarkable prototypes of those in use at the present time, had been put in operation. Considering the class of material handled, it is doubtful whether any more efficient device has ever been designed than the Australian circular cast-iron puddling machine, which is a vat 17 ft. diam. and 2 ft. 6 in. deep, with two cast-iron circular harrows revolving about 7 revolutions per minute.

Puddling Machines for Treating Gold-Bearing Gravel.

In the Ruthergla district, principally for the sake of creating a higher dump for the tailing, the gravel, after the wash-dirt is puddled and dropped into hoppers under the puddling machines, is run into skips, elevated through a vertical shaft, and emptied automatically into a bin, from which it is washed in a

trommel which throws off the coarse stones, the sand and gravel falling through the perforations into a sluice with a fall of 1½ in. per foot, and the flow of water carries away the sand and gravel and leaves the gold in the riffles, which are generally of the Venetian-blind pattern, except at the top, where ordinary rails are used. On the other alluvial districts of the State, elevators are not used, the dirt being puddled in layers, and the rough stones, which always rise to the top, are forked out two or three times until the machine is full. The gravel is then dropped onto a floor through a trap door in the bottom of the machine by sheet-iron scrapers attached to harrows, revolving at a slow rate of speed. It is then shoveled into a sluice under a strong jet of water, which acts in the same manner as the sluice at the head of the elevator above mentioned.

In the case of the Berry United Deep Lead, Ltd., controlled by Bewick, Moreing & Co., belt-conveyors are being installed for the purpose of elevating the puddled dirt, and it is generally considered that this method will be an improvement upon existing appliances. With the exception of these two innovations the plants for working deep alluvial mines are similar to those in use 40 years ago, only that the pumping engines in some instances are more powerful, where the leads have been traced into open country away from the ranges. In several instances triple-expansion high-pressure engines working 26-in. Cornish pumps have been installed to cope with the heavy flow of water in the old river-beds. In the early days the pumping was done in some instances with Cornish beam-engines and pumps up to 22 in. diam., and immense quantities of water were raised. But in most cases a single-cylinder horizontal non-condensing engine was used, but they proved expensive in fuel. The first company in the State to use a compound engine for pumping was the Chalks No. 3 at Carisbrook, which installed a cross-compound, with 16-in. high-pressure and 28-in. low-pressure cylinders, 4-ft. stroke, and having horizontal condensers. Three Cornish flue-boilers, 26 ft. by 6 ft. 6 in., at a pressure of 110 lb. per sq. in., gave ample steam to work two Cornish lifts 20 in. diam. to a depth of 270 ft., pumping the water 30% cheaper than any other class of engine. Other instances could be cited where compound and triple-expansion engines, working pumps up to 26 in. diam., have given satisfaction, and within the last few months Bewick, Moreing & Co. have installed at the Berry United Deep Leads, Ltd., a high-speed engine with rope gear to drive a 26-in. Cornish lift, in a shaft 600 ft. deep, and are pumping the water at one-third less cost than a cross-compound engine working a 22-in. lift of pumps at the other end of the same mine. This is the most important innovation in pumping machinery that has taken place for many years, as the cost of fuel is becoming a more important factor in the development of Australian mines every year, especially as the deep leads for the most part have been traced into the open country, and are overlaid in many cases with basalt 300 ft. thick.

The old rivers or leads take their rise in or close to low ranges of slate and sandstone, and gradually dip away toward the seacoast. In some instances, owing to volcanic action, the old rivers were faulted across, and one part tilted up, but otherwise not disturbed. In other cases dikes of basalt cut through the old leads and remained in the form of thick walls of rock, which greatly puzzled the alluvial miners of early days. In one break of this kind a stretch of channel a half mile long and 1000 ft. wide was engulfed, and remained as a formless agglomerate with ejecta from the volcano.

Of late years such rich pay dirt as was worked in the fifties has not come to light, nor even such gravel as was worked in the eighties by the Madame Berry lead in the Ballarat district. The phenomenal yields got at Ballarat in the early days, such as a pound weight of gold per pan, and nuggets such as the Welcome nugget, weighing 2217 oz., are only like a dream, but there still remains about 250 miles of deep lead to be worked. The great obstacle to the development of these old river-beds is the quantity of water contained in them, which in some instances has cost hundreds of thousands of pounds to drain the ground sufficiently to admit of testing the mine. But these leads have been so rich in their higher reaches that there is hope that history will repeat itself. Most of the best leads travel close to or along the back of the auriferous belt from which they took their rise. This is an important factor to be considered when estimating the chances of finding payable gold, as a lead which travels across the strike of the auriferous country is invariably of a patchy character, being fed from time to time by the gold-bearing strata over which it passes, whereas a lead traveling in the direction of venation has been fed on its course by the denudation of the auriferous ranges, which at one time stood thousands of feet higher than they do today.

As to the deposition of gold in these leads, there is one important fact which may be of interest, which is, that the best gold is not always found in the deepest part of the lead, it being sometimes on one bank and sometimes on the other, and then at times in the deepest part. It is now generally understood that, where these reef washes occur, the gold was originally laid down at a comparatively shallow level, and that at a subsequent period the river cut a new and deeper course for itself, sometimes outside the original bed, and in that case the deep channel will be found to be poor. At other times the deep channel would encroach on the original bed and wash away a portion of it. Then we may find the main channel payable, while in some cases the original channel is washed away altogether for a considerable distance, and all the gold is deposited in the deepest part of the lead. At other times the deep channel takes a sinuous course and cuts across the original formation many times, with the result that the gold is found alternately in the deep and then on the shallow ground. This shallow ground is termed 'reef-wash,' and near the source of the leads is similar to the placer mining of America. Waldemar Lindgren, of the United States Geological Survey, who reported on the deep leads of Victoria a few years ago, said: "I wish to reiterate my

admiration for the excellent work already accomplished, and my belief that deep-lead mining is an industry of incalculable value, well worthy of encouragement and protection. The gold-bearing region of California presents great similarity to that of Victoria in climate and geological structure. The reefs in California have been formed in exactly the same manner as those of Victoria, and their erosion has given rise to the same gold-bearing gravels, but

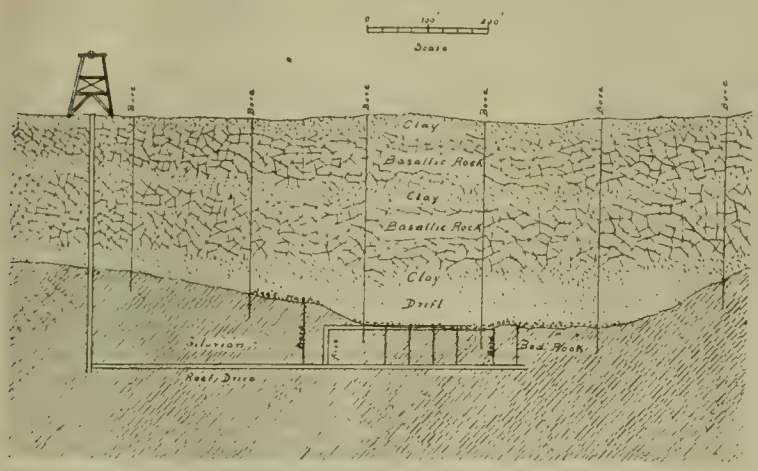


Fig. 1. Cross-Section of Deep Lead.

I think it may be said that on the whole the deep leads of Victoria carry more gold per fathom than those of California. The skill and enterprise shown by the old-timers in overcoming the great difficulties of alluvial mining in the early days, notably at Ballarat, are truly admirable, and there has gradually been evolved a class of mining men second to none in solving the dangerous problems of handling the loose and water-soaked sands and gravels far below the surface."

While Victoria has a splendid climate, and good farming and grazing lands, the prosperity of the country still depends to a great extent on the gold-mining industry, the industry which made the country what it is today, which employs directly 25,000 men, and indirectly many thousands more. Since 1851 the output of gold in Australasia has exceeded £500,000,000, and Victoria can feel proud of the position it occupies in the industry, as it has contributed over £276,000,000, partly from alluvial and partly from quartz mining. The present annual output from all sources is valued at about £3,200,000.

While the foregoing will give some idea of the value of the gold-mining industry to this State, a few practical hints on the working of alluvial mines may be interesting to the younger generation of miners, who may be called upon to open up deep leads in countries where, up to the present, no attention has been bestowed upon this class of mining. The greatest difficulty the alluvial miner in this State has to contend against is the immense quantity of water contained in the drifts overlying the wash in the gutters or ancient river-beds, and to cope with this water successfully and economically is the point to be aimed at by mine managers. If they thoroughly understand this part of the business, they will not only win credit for themselves, but will be the means of saving large sums of money for the companies they represent, and, in many instances, will make a success of a venture which otherwise might be stopped for want of funds before being properly proved. Of paramount importance in laying down the plan for opening up an alluvial mine is the determination by boring of the position of the deepest channel of 'wash,' as well as both banks of the old river (called 'rim' in California 'Blue-lead' mining), and note the depth of drift and gravel overlying the wash, since the quantity and pressure of water likely to be encountered depends largely upon the amount of drift met with. While mentioning drift, it is well to say that experience has taught us that what appears to be sandy clay in a bore has given as much trouble in sinking a shaft as the worst classes of 'drift.' It can safely be said that all managers and directors who have had experience in sinking a shaft through this material are agreed that the cheapest and safest course is to select a site for a shaft to one side of the lead and clear of all 'drift,' as immense sums of money have been wasted in sinking through drifts from 50 to 100 ft. thick. The difficulty consists in the soft material under pressure of water boiling up into the shaft. The matter of driving a few hundred feet is of little consequence, and will cost infinitely less than sinking a shaft through more than 10 or 15 ft. of drift.

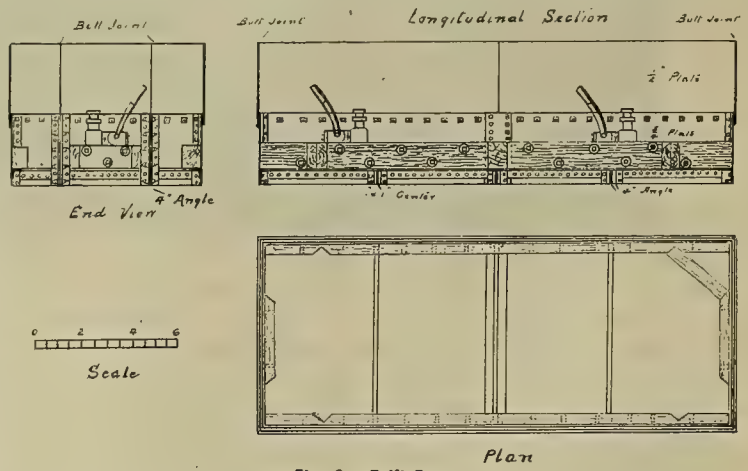


Fig. 2. Drift-Box.

Where necessary, however, a shaft can generally be sunk with a properly constructed drift-box, such

as is illustrated by Fig. 2. The box is formed to suit the size of the shaft being sunk, and should be made large enough to receive another box inside of it which would be the ordinary size of the shaft, as the first box might become immovable before the required depth was attained. The box should be made of steel-plate ¾ to 1 in. thick, according to the size of the shaft; depth of plate, 3 ft.; the side to be in two pieces, joined together by a vertical plate 2 ft. 6 in. long, about 12 by 1 in., riveted to one part and bolted to the other with ⅞-in. bolts; the end to be in three pieces, the two corner pieces to be about 1 ft. wide, to be riveted to the sides with 4-in. angle-iron, and to have a piece of 4-in. angle-iron riveted to the opposite edge, and bolted to the angle-iron on the centre-piece at the end; and finally, a 4-in. angle-iron to be riveted all round within 3 in. of the bottom of the box. The timber, 12 by 8 in., should be bolted with ⅞-in. counter-sunk bolts 18 in. apart, the nuts let into the wood on top of the angle-iron, on which to place the screw or hydraulic jacks. All rivets should be ⅞ in. and placed not more than 4 in. apart, and counter-sunk at the back of the box. Bolted all round on top and at the back of this box is a plate 3 ft. 6 in. by ½ in., with ⅞-in. bolts, 9 in. apart, fitted close at the corners. This part of the box stands up behind the 'slabbing' of the shaft, the slabs being cut to fit close to the plate so as to prevent the 'drift' finding its way between the plate and the slabs. Plates the full depth of the box are best, if procurable. The sides complete, with corner pieces attached, forming the ends, can be lowered into the shaft in one piece and placed in position; the two end-pieces are then sent down and bolted to the corner pieces, and the box is complete, with the exception of the strong centre-pieces, which should not be overlooked. If the shaft is extra wide it can be stayed by diagonal pieces of timber across the corners of the box. Before the box can be lowered into the shaft, the shaft must be enlarged in the clay which generally overlays the drift. As soon as the box has been placed in position, a few sets of slabs put between the shaft-timber and the jacks completes the work and the box is ready to be forced into the drift. Care must be taken that equal or unequal pressure be placed on the jacks, so long as the box is kept as near level as possible. The nose must be kept well down in the sand.

The depth to the lead having been ascertained by boring, and about 20 ft. added in case there should be deeper ground between the bores, the shaft should be sunk far enough into the bedrock to allow for a rise in the bottom of the main level of about 2 in. in each 100 ft., and to permit of the lead being worked, say, a mile down the lead, or to the boundary, if less than a mile. I have found that the above fall is sufficient to provide a good gangway for the trucks traveling each way. It also serves as a good water-lodgment when the road is laid properly, and does not form a man-trap for the workmen in the manner that drifts driven at a deeper gradient do in wet alluvial mines. There might be enough water in the chamber to drown a man, while the drift a few hundred feet from the shaft would be clear of water. It also means that all the silt would find its way back into the shaft, instead of settling along the main level, where it could be easily and cheaply removed. In addition to the lower level in deep and difficult alluvial mines, an upper level should be constructed in the bedrock, for two important reasons, (1) to provide an escape for the men in case the mine should be flooded, and (2) as a return air course. This applies to leads covered with basalt particularly, where separate air-shafts are costly to sink.

Many years ago it was considered the correct thing to drive in the wash and meet the water in the face, or to put up small rises or 'bleeders'; but this course proved so disastrous in many cases when going into a lead for the first time, that it has been abandoned by all managers of experience in favor of a series of cased bore-holes. Boring for water in this manner requires some experience, but the precautions necessary to be taken depend somewhat upon the nature of the bedrock through which it is intended to bore. Unless the country is hard, from 5 to 10 ft. of 4-in. tubing is forced with a jack into a hole bored slightly smaller than the tube. The tube is then wedged round together at the back of the drift. A hole is then bored with a smaller augur or bit, just large enough to admit a 3-in. tube, the joints of which have been fitted to run easily. The tube should also be beveled inside at the upper end, and perforated with ¾-in. holes for about 4 ft. from the top, so as to act as a filter when the tube has been forced up into the wash. The best length of tube is 5 ft., with a few shorter lengths for matchings. A large nut is screwed onto the male end of the tube to protect the bottom thread while the tube is being forced. This nut is 3½ in. deep, made of wrought or cast-iron bushed, the top 2 in. hexagonal in shape, 5 in. diam., and the lower 1½ in. square, and 7 in. diam. Through the square position a slot 3½ in. by ½ in. is cut through to receive a slide ⅜ in. thick, should the bore go through to sand instead of coarse gravel. It is often impossible to plug a bore that is running sand with a strong pressure behind it. It is necessary, in soft gravel especially, to exercise great care not to bore the hole too large for the tube, as the water would then get outside the tube, and should there be much pressure, the water would scour the hole large enough to permit an inrush of sand. By this system of tubing, in moderately firm ground the water can be drawn off in quantities equal to the capacity of the pumps; and should anything happen to the machinery, necessitating a stoppage, it would be found that part at least of the tubes could be shut off with cocks without fear of causing the water to flow outside instead of inside the tubes. But we know that "the best laid schemes of mice and men gang aft aglee," so it is necessary to make provision in case an inrush of water and sand occur unexpectedly, the pumps may be protected from being filled by sand. This is done by constructing strong locks or doors at intervals along the drift. The ground is cut out about 2 ft. into the sides, back, and bottom of the level, and a heavy frame set, with two centre pieces in it, placed in the excavation, and boarded up

close on each side. A door about 6 in. thick is hung with strong hinges in such a way that a man can close it easily behind him, being cut in two on the bevel in the same way as a stable door. These doors are not made air-tight, as the compressed air in the event of an inrush of water would blow them out. Experience has shown that where there are a number of these doors along a level, a large accumulation of sand may be found between the doors nearest the face, but the sand will not, as a rule, reach the pumps.

When the mine has been drained, or at least the great pressure of water taken off, and not till then, is it practicable to open up the lead in a systematic and profitable manner; but managers have frequently found it difficult to convince directors and shareholders of this fact, so they have been forced to drive into the wash, with disastrous results to all concerned. The proper time to attempt to open up the wash is after several bore-holes have eased so much that they have started to draw in air, and the pressure-gauge indicates about 20 ft. of water above bedrock, and even then it is advisable to be extremely cautious and attend to everything likely to insure the safety of life and property. A short cross-cut should be driven off the main level at a point outside the deepest run of wash, and a door hung near the opening. A raise should then be constructed near the end of the cross-cut, and opened out in bedrock, the back of the drift being slightly above the level of the deepest wash proved by boring over the back of the main drift. About 12 ft. from the top of the raise another door should be hung, so that in case of a rush of water the men could close the door and so be enabled to descend the 'jump-up' safely.

In conclusion it may be remarked that deep-lead mining has been somewhat under a cloud for several years, but this is due principally to the great cost entailed in pumping out the heavy flow of water, and not because the gold-content of the leads is much inferior. These periods of inactivity have recurred at intervals in the past, and then some mine would make a discovery that would give an impetus to the industry sufficient to cause fortunes to be made and large areas prospected. At present the outlook is promising, as some of the mines with famous histories are approaching that stage when shareholders expect to be rewarded for their outlay.

The Loddon Valley Deep-Lead Mine, Victoria.

Paper from rice straw is reported to be a commercial probability, according to experiments recently made at Bargor, Maine. It is claimed that $2 per ton may be realized in the rice straw which is now wasted.

Emery was produced in the United States during 1907 at but two localities—Chester, Mass., and near Peekskill, N. Y. The total amounted to 1069 short tons, valued at $12,294.

The world's coal production during 1907 amounted to 1,209,184,109 short tons, of which the United States furnished 480,363,424, or nearly 40 per cent.

DECLINE AND REVIVAL OF COMSTOCK MINING.—II.

Written for the MINING AND SCIENTIFIC PRESS
By WHITMAN SYMMES.

In the early sixties, many mines put up their own mills, but the men who controlled the mines soon separated the mining from the milling business, and held the mills as their private graft. The 'bonanza firm' privately owned the mills that worked the Con. Virginia and California ores; they likewise owned the Omega mill, which worked the tailing from their other mills. By 1876, the Comstock mill-men had learned how to get a pretty good extraction from the ore. The best managed of these, the Lyon mill, at Dayton, was working sand-tailing that assayed $5 per ton for less than $2.50 per ton. As difficulty was experienced in buying $5 tailing, the extraction of the mills must have been good. Senator Jones, that is, he who became Senator Jones, worked some ore for Fair and Mackay, who did not happen to be interested in the mill, and they are said to have received in bullion more than 90% of the battery-pulp assay. On the Comstock the pulp-assays used to run about 10% below the car-samples, so that 90% 'battery-assay' represented about 81% of the value of the ore. The mines did not have their own assay-offices, neither did the mills, but there was a general assay-office for the mines and mills controlled by each 'ring.' The mines did not sample the ore shipments, but let the mill-men do it; this was in the interest of economy, as it was manifestly unnecessary for the same partnership to sample the ore twice. The mills were supposed to return to the mines in bullion not less than 65% of the average battery-assay (which would be equal to about 58.5% of the car-sample assay). There are but few examples on record where the mills returned more than they had to. In 1876 the Belcher mine shipped to the mills 131,328 tons of ore yielding returns of $2,920,460 in bullion, an average of $22.23 per ton. For milling the mine paid the sum of $1,534,925. The mills on the Carson river (putting through 4 tons per stamp, crushing to 6 mesh, and then re-grinding in pans) worked for about $3.50 per ton. At first they paid $2 for transportation, and later $1. They charged the Belcher $10 for milling and transportation, thus making a profit of $4.50 per ton, or $590,000. In 1876 they probably extracted about 85% of the battery assay-value and delivered to the mine 65%. Thus they retained 30% more bullion than they delivered to the mine owners. The mill profits were thus $590,000 from milling charges and $875,000 from excess bullion, making a total profit of $1,465,000 from the Belcher alone, while the mine accounts for the same year showed a loss of $600,000. Crown Point was similarly looted, and during the year its stockholders were assessed $500,000. These operations were made possible by the trustee system; the five directors of the Crown Point in 1876 held an aggregate of only 175 shares.

The Comstock mines, which produced more than $25,000,000 in 1875, produced only $5,300,000 in 1880, and $1,700,000 in 1881; in fact, at the end of 1880 not a stamp was dropping on Comstock ore—all the mines were exploring for new bonanzas between the 2000 and 3000-ft. levels. The profits of the mill-men had disappeared, so they began a new deal. In January, 1881, Sam Jones started 16 stamps at the Mexican mill on Crown Point ore, taking the poorer rock that formed the periphery of the old bonanza orebody, and which had previously been considered too poor to pay. In April the Vivian mill started on Belcher ore, and the Brunswick followed on ore from the Yellow Jacket. It was not long before the Belcher was producing as much as 6500 tons per month, Crown Point 6000, and Yellow Jacket 5000 tons. The bullion returned by the mills to the Gold Hill mines during the eighties generally averaged $12 to $18 per ton. Between milling charges, excess bullion, and false sampling, the mills were enabled to absorb everything in sight, and they had their trustees load on as many assessments as they thought the stockholders would stand. 'Low-grading' proved a great success; it was the counterpart of the modern 'high-grading' at Goldfield.

When Gold Hill was flooded for the first time in 1880, the managers probably thought it necessary to pump out the water and search for new bonanzas in order to find ore for their mills. When Gold Hill was flooded for the second time in 1882, they saw that pumping was unnecessary. They had then been milling low-grade ore from the upper levels for nearly a year. Why should they spend the assessment-money in pumping and in deep exploration, when they could divert an equal amount into the milling business, which was the same as their private bank account? Gold Hill remained flooded, and J. P. Jones carried the low-grade system into Virginia City. In 1885 he fixed up a deal with the Consolidated California & Virginia (consolidated November, 1884), leasing the ground above the 1550-ft. level at a flat rate of 50c. per ton, which was 3% of the bullion he says he took out. At the same time the Con. California & Virginia Co., having abandoned its lower levels to the flood, went to work on the 1750-ft. level. By April, 1886, when the middle mines were still struggling against the water and heat near the bottom of the Combination shaft, 'low-grading' was such a success that there was not an idle mill in the district. During 1887, 30,000 tons per month was being crushed. The bullion output of the Comstock slowly and steadily increased during the eighties, and in 1890 the Comstock was the liveliest mining camp in the West. But by that time the low-grade ore of the bonanza orebodies was nearly exhausted. What was stolen during this era will never be known. It is significant, however, that while in 1888 the mine accounts show a production of $5,500,000 in bullion, Wells, Fargo & Co. carried out $7,500,000, and this latter amount does not cover the midnight drives to the Carson Mint.

The monotony of 'low-grading' was varied by the finding on the upper levels of some bonanzas that had been overlooked in the earlier days, and in consequence there were several stock deals that brought back the excitement of the sixties and seventies. It

is said that Senator Jones found a new bonanza 'fissure' just to the east of the old Con. Virginia stopes.

Gold Hill, Nevada, Showing Crown Point, Yellow Jacket and Exchequer Mines.

while working his leased ground, and that Mackay took him into the deal to keep him quiet. In October, 1886, the 'middle' mines ceased pumping at the Combination shaft, and it was generally considered that the days of profitable mining on the Comstock had passed. The search for deeper bonanzas was over: low-grade mining in the mountains of ore on the upper levels of Gold Hill had been tried for five years, and had brought only assessments to the stockholders. Many of the brokers sold the stocks short, and Mackay and Flood took all that was offered. Then the news of the strike was let out, and faith in the upper levels returned. To assist the deal Mackay went to Virginia City, and the report was given out that he was going to remain there and take charge of Con. California & Virginia. In two months Con. California & Virginia went from $1.95 to $55, Ophir went form 65 cents to $35, Hale & Norcross rose from 55c. to $9, and Best & Belcher, Savage, and several others went up similarly. The 'shorts' were trapped, and there were many failures among the brokers. Robert F. Morrow (the ablest operator on the street since James Keane went to Wall Street), who nearly always operates as a 'short,' is said to have an unpleasant recollection of the deal of 1886.

During 1887 Con. California & Virginia produced 125,876 tons of ore that assayed more than $30 per ton, and the mine yielded $3,527,000 in bullion. Dividends of $1,080,000 were paid. The next year the same mine produced over $4,877,000, and paid dividends of $1,188,000. Hale & Norcross found a new bonanza on the 700-ft. level that brought the mine $840,000 in bullion for 1888, and paid $224,000 in dividends. Confidence found a bonanza on the 1100 and 1200-ft. levels, and produced $977,000 in bullion, and paid $175,000 in dividends. The 'shorts' were caught again, and in two months Confidence was sent from $8 to $52.

Kinkead Mill, C. & C. Shaft, with Mt. Davidson in Distance.

Butters Cyanide Plant, Virginia City, Nevada.

But these were the 'leaders' that were used to sustain interest in the Lode and extract assessments for the other mines. The reversals of form were sudden and violent. The MINING AND SCIENTIFIC PRESS made trouble. In June, 1889, it wrote to the title 'What Becomes of the Bullion?' and followed it up under such head-lines as 'The Mines in

the Hands of the Mill-Men.' In July, 1890, it reported that the "Hale & Norcross managers are building another reservoir to catch the rich slime that is allowed to escape through their peculiar mode of milling. Our correspondent says that this slime assays from $30 to $40 per ton, which he thinks is very good slime to come out of $20 ore." This mill, being in Carson City, was more accessible to observation than most of the others, which were 20 miles away, on the Carson river. The MINING AND SCIENTIFIC PRESS further reported that "in the Confidence on the 1100-ft. level they are in good ore, assaying $60 per ton, which they are running out through the Yellow Jacket, but of which no further record is kept." In other issues it was pointed out that the Con. California & Virginia and the others, did not sample their ore, as required by law, and that only the millmen sampled it; that the mills could extract 85 to 90% of the battery-assays, while they returned 65%, and that some mills were steadily working 100 and 200 tons of tailing per day. The trustees were slow to act, but they finally found it necessary to do something to save the trustee machine.

In the spring of 1893 the ore from the Con. California & Virginia averaged $30.46, the battery-assays $27.43, and the bullion returned was $23.98, or 87.4% of the battery-assays. The Nevada mill, which had previously extracted only 30% for the Hale & Norcross, now worked $27 ore for the Potosí, and extracted 79% of the car-sample and 88.3% of the battery-assay. But the good results arrived too late. As occasionally happens in the land of the free and the home of the brave, the grafters had remained free and brave long enough to get away with nearly everything in sight. The production of the Lode in 1892 had fallen off to two millions, and for the rest of the nineties there was 'very little doing.' Some good ore was found to go below water-level in the Gold Hill, and in 1890, R. F. Morrow formed the Gold Hill Pumping Association. After a year of delay a steam-pump was started in the Crown Point incline. The water was lowered a couple of hundred feet, but the expense was enormous. Charles Hirshfeld, in command of the Bullion and Exchequer, could not collect the assessments, and on the withdrawal of those mines, pumping was stopped.

Morrow and Sharon, in an effort to keep Gold Hill alive (and their mills in business) worked the low-grade 'gold vein' on the foot-wall, beginning in 1891. The ore milled gave assays from $14 downward, and up to the year 1894 considerable quantities were extracted from the richer portions of the gold vein. The ore was milled and concentrated on Frue vanners at a charge of $2 per ton, and the railroad made a special rate of 65c. per ton to the Carson river. By piecing out with a liberal levy of assessments, Morrow, Sharon, and others were able to bear up against their fallen fortunes. The trustee system faced hard times in 1893. The Exchequer company took in 66% of its stock on a delinquent assessment: the Alta took in 51%; Hale & Norcross, 23%, and so with others. Then the miners were asked to accept a reduction of wages from $4 to $3 per day: but the miners, being 'wise to' the situation, gave the retort courteous. They told the companies that they would have to reform themselves first. They pointed out that A. C. Hamilton was drawing $2500 per month as superintendent of six mines and the Ward shaft, and was spending most of his time elsewhere than on the Comstock Lode; also that other superintendents were doing likewise. The miners' committee pointed out that the salaries were out of all proportion to the number of men employed. In Alta, for example, not a pick was swinging, but the salary list was $675 per month, and the monthly expense reached $3475; Alpha spent $60 for wages and $375 for salaries; Confidence had one miner, and paid $300 in salaries; Overman spent about as much money for salaries as for miners; and so it went. The managers beat a hasty retreat, lest the miners might give the public further undesirable information. The Comstock may languish, but it is never dead. Just when the public had lost interest, the system again found a leader. Con. California & Virginia, a never-ending wonder, in 1894 found some $80 ore, and cheered the market with a dividend. It takes only one leader on the Comstock to furnish 30 other mines with assessment money. The system survived, but it was not thriving.

In 1898, the Comstock Pumping Association was formed by Charles Hirshfeld, a stockbroker. After many delays the water was lowered in the C. & C. shaft, and as a consequence Con. Virginia (name changed again) found an orebody on the 2050-ft. level that was followed across the line into the Ophir. The latter has been stoping ore continuously since October, 1903. This orebody, which has been producing both shipping and milling ore, is proof positive that the former criticisms by Becker and other writers were warranted: namely, that the lower levels were never properly explored in the eighties, and that there are large areas below the 2000-ft. level that have never been explord at all. In consequence of this success the Ward Shaft Association was formed by the 'middle' mines in 1903, and has now recovered that shaft down to the 2475-ft. station. The work at both these shafts was described by Walter D. O'Brien in the MINING AND SCIENTIFIC PRESS of June 13, 1908. With the renewal of deep mining in 1903, affairs on the Comstock were slightly revived. Many men who knew the history of that wonderful district again took an interest, and have since been regularly contributing to the assessments. It was represented that the Comstock managements had reformed; that there was no more graft; that the companies were now being run honestly in the interests of the stockholders. But the public gradually recovered from this pleasant delusion, and 1908 came in with almost universal expressions of distrust.

It must not be supposed that the Comstock trustee-system, fashioned like a political machine, has survived for more than four decades without some assaults upon it. In 1876 there were a number of changes in the directorates. After the report of the Belcher for that year there was an attempt to get the stockholders together, but without success. In 1890, M. W. Fox brought suit against the directors

of the Hale & Norcross to account for some of the 'very good slime' that had been going through their privately owned mill, and in 1895 he got a judgment. The Mining Stock Association was formed in 1890, ostensibly to combat the 'system.' The stockholders of the Kentuck brought suit against Governor Stevenson of Nevada, who was milling the Kentuck ores, and the Governor compromised. Attempts have been made to amend the laws. In his message to the California legislature in 1877, Governor Irwin said: "There should be legislation to better protect the stockholders in mines from the mismanagement and rascality of the directors. . . . The laws should compel directors to operate mines in the interest of all the stockholders, and not in the interest of an inside ring." In consequence, stockholders got the right to inspect their own mines, which the managers had formerly denied to them; but the 'system' was left intact. In 1880, Senator Felton introduced a bill to make presentation of certificates good for votes at company elections; but it also had the impractical provision that the names of both trustees and trustors must be entered on the books of the company. In 1891, Assemblyman Bert introduced an act to give bona-fide stockholders the right to vote their stock, whether it stood in their own names or in that of the trustees. And in 1905 a law was passed providing that only bona-fide stockholders could vote. This endangered the vote of trustees who did not know who their trustors were, but no advantage was taken of it, and the law was repealed by the next legislature. The only way thus far by which the system has been worsted has been by a group of men buying control. In the last couple of years the Virginia 'system' has thus lost the Best & Belcher, and the Gold Hill 'system' has lost the Yellow Jacket and the Crown Point. The trustees, of course, own no stock. They never would think of paying assessments. When a few stockholders have kicked, the machine has laughed at them; when the machine has been tackled hard, it has pretended to reform. In 1883, the MINING AND SCIENTIFIC PRESS published an editorial on 'The Top-Heavy System.' "It was a poor way," it said, "to raise $100,000 by assessments, and fritter away $75,000 of it in useless expenditures, the other quarter going to the mine. With the new order of things now going on there is a much better prospect for the mining interests." But the old order, and not the new, was what the stockholders found in existence on the Lode in the spring of 1908.

There were two systems in control: The Gold Hill mines (except the Yellow Jacket) were controlled by R. F. Morrow, of San Francisco, and W. E. Sharon, of Virginia City. It is the same old game, although the plum tree is not as fruitful as of yore. Morrow was in the Gold Hill 'mill-ring' more than a score of years ago. W. E. Sharon is a nephew of the man who was the father of Comstock high finance. The Morrow machine collected $153,234 in assessments in 1907, and kept about a dozen men at work (one shift) underground. That means that only about 10% of the money was spent in miners' wages. The Gold Hill mines did no pumping, and the rest of the money went into general expenses, including salaries. When H. L. Slosson, Jr., took over the Yellow Jacket from the Morrow interests, he made it produce 180 tons per day, instead of nothing, and his salaries amounted to just one-half of what they were under the graft régime. So little was being done by the Morrow machine that one man had time to be foreman of seven mines. The superintendency of these seven mines was of course an honorary office, of the pleasant type evolved under the trustee system.

The Confidence, Challenge, and Imperial are jointly running a drift toward the west outcrop from the bottom of their shaft on the 70-ft. level, not much below the bottom of their dump. They collected nearly $40,000 assessment money in 1907, and are advancing 10 to 11 ft. per week. This means that the gross cost of this drift is $70 per foot; it could be run by contract for $15. The Morrow managers are good fellows, and as jolly entertainers as can be found anywhere, but from the financial standpoint, their mines are bad actors—even for the Comstock.

In the Virginia district the trustee machine was found to be composed entirely of brokers. They did not hold stock persistently. Look on any stock-book for the men who had the smallest number of shares and you identified the board of directors. At the Ophir stockholders' meeting of 1907, 26 shares were represented in person. At the Chollar meeting of 1908, the directors had 31 shares (total market value $3.10) in their own names. It was the same old system. Coherence is given to the Virginia system by means of the Comstock Pumping Association and the Ward Shaft Association, an offshoot of the former. The same men being in control of all the mines (except the Best & Belcher and the Hale & Norcross), they could dip into the different treasuries for pumping expenses as they saw fit, just as though the assessment money of the different mines had all been thrown into a common treasury. For instance, Con. Virginia, and not the pumping association, paid $100,000 for the Riedler pumps, and for many years (up to February, 1907) that mining company also paid for the six men who attended those pumps—because Con. Virginia has a name that can raise money. When Con. Virginia had ore it paid 50% of the Comstock Pumping Association's expenses, and Ophir paid 35%. When Ophir got ore, the figures were reversed. It is evident that the mines must contribute to the expense of pumping, but it is disquieting to the stockholders of one mine to have no written agreement with the other mines, and not to know for how much the trustees may dip into the treasury. Gould & Curry is 2100 ft. nearer to the C. & C. shaft than to the Ward shaft, but it contributes more than half its income to the latter. The fact that Gould & Curry will probably never use the Ward shaft does not seem to occur to its board of directors—as the Ward shaft needs the money. Honorary superintendencies still exist. The State Treasurer of Nevada, D. M. Ryan, is superintendent of the Sierra Nevada, Mexican, Union, Bullion, Alpha, and Exchequer. The Secretary of State, W. G. Douglas, is superintendent of the Gould & Curry, Chollar, Po-

tosí, Justice, and Alta. The town clerk also gets on the salary-roll. This is no argument against the gentlemen mentioned, but against the system that employs mining superintendents who do not have to spend all of their time at the work of mining. D. M. Ryan's work at the Union shaft was excellent, and the plant was spick and span. But the Sierra Nevada, Union, and Mexican collected $120,000 in assessments in 1907, and were employing underground not much more than two miners per mine. Instead of spending 50 to 75% of their money for miners' wages, as other mines that have no smelting charges are able to do, the Union Shaft mines spent about 8%. Ophir was found to be grinding out money for pumping expenses and salaries, but with ore that averaged above $30 per ton, and stopes 25 ft. wide, opened on two levels, it was producing only 40 tons per day. On April 18, 1906, it had $50,000 in bank, and at the end of 1907 it had $19,000. For the six months from October, 1907, to March, 1908, inclusive, its average receipts per ton were $25.70, and the expenses were $25.06. Considering the work to be done, its expenses were probably the highest in the world. Gould & Curry collected $32,400 in 1907, contributed $17,500 to the Ward shaft, and absorbed the balance without one miner being at work—in fact, it had not done any mining for many years. Savage had only two or three miners at work (through no fault of its superintendent); likewise the Hale & Norcross; likewise the Chollar and Potosí together. The Julia and the Bullion contributed to the Ward shaft, but the only mining man in sight was W. C. Ralston, secretary. The Alpha and the Exchequer also contributed and did no mining.

The Comstock system is cleverly devised. By giving a man a number of salaries the amount entered on the books of any one company seems small, but the aggregate is much larger than would be paid for the same service in the competitive world. Behind the mines stand the shaft associations and the pumping associations. These spend the money for the mines. For example, the Ophir does not pay its own miners nor purchase its own supplies. A stockholder cannot find out whether his money is being honestly spent except by going through a great multiplicity of accounts. The accounts are not kept after the ordinary manner, and it is impossible to determine what are the different components of the cost of mining except by observation on the ground. For instance, a clerk may be on the salary list, and also gets $40 more salary on the pay-roll. One half of the time of the chief machinist at the C. & C. shaft was charged to compressed-air, not because the compressors had been repaired, but because it was necessary 'to charge his pay against something.' As a matter of fact, he had been very busy on other work. The Con. Virginia has been running a drift on the 2350-ft. level to ventilate the Ophir stopes, and has been paying for it at the rate of $60 per foot for labor alone. It is of no use to the Con. Virginia, but the five Ophir directors are all Con. Virginia directors; so they dipped into the Con. Virginia treasury for the coin.

The trustees do not appear to have exercised ordinary business ability in their dealings. In 1899 they had $100,000 on hand with which to obtain electric power. The Riedler pumps (to be installed) required a maximum of 600 hp., and 1000 hp. would fill all the requirements for some years to come. The field was open, and the mines could have built their own power-plant on the Truckee river, and have put up a 26-mile transmission line, from the money they had on hand. But instead of doing that, they gave the $100,000 to the Fleishackers with which to build a plant. Of course, it was pretended that they got the $100,000 back in the form of rebates, but that was a mere matter of phraseology. If it is figured that they paid $5.60 per horse-power month on peak-load (they now pay $5), then they did not get it back. The advance was $67 per horse-power on the plant installed, and was about enough to build the cheap type of 1500-hp. plant that was constructed. The company is said to have paid a dividend a month after it started. The Fleishackers have since installed 1000 hp. more, and are getting about $100,000 per year out of the stockholders, with more to come. Ophir has been paying for a rock-breaker, and then paying the Kinkead Mining & Milling Co. $2.70 per ton for milling and concentrating. For the last two years it has had enough money in its treasury to build a mill, and enough ore in sight to pay for the mill by the saving in cost of milling. The Kinkead Mining & Milling Co. is said to pay 100% dividends per annum.

There has been no evidence of an appreciation of the relation of fixed cost to total cost of mining or exploration. It does not appear to matter how much money is used for salaries and pumping while the Ward shaft is being put down, or while the Savage, the Hale & Norcross, the Chollar, and Potosí are waiting for transportation in the Sutro Tunnel. It is interesting to note what happened when the Con. Virginia was shut down during the late financial crisis. In his report of November 8, 1908, the superintendent said: "All work in the mine has been suspended." Mining was not resumed until January, 1908. The mine expenses average $13,000 per month; in December less than $4000 per month was cut off, and less than $2500 per month was saved by stopping the mining work that had been going on. During the Company's fiscal year 1907, more than 81% of the cost was for fixed expense, and less than 19% was for mining work on the 1600, 2250, 2350, and 2450-ft. levels. If we except the 2350-ft. drift, which was run to ventilate the Ophir stopes, then less than 10% of the stockholders' money was used for actual exploration, other than fixed expenses. One of the noticeable features on the Lode today is the slowness with which the drifts are advanced. In the seventies and eighties it was the exception for a drift to be advanced less than 30 to 40 ft. per week. This refers to average ground and not to drifts like the Chollar-Potosí 3100-ft. level, which was advanced in the black dike on the footwall for week after week at the rate of 80 ft. per week. The best work done recently was in October, 1905, when the Ophir reached the 2200-ft. level by a

winze that had been sunk 200 ft. through rich ore. The drift from the bottom of the winze was advanced for two weeks at 25 ft. and for three weeks at 30 ft. per week. After that, lethargy set in again. In the Con. Virginia the average progress on the 2250-ft. level during the calendar year 1907 was 15.8 ft. for the 33 weeks that work was being done. The big men of the bonanza days may have been grafters, but there were a few miners among them.

It is only reasonable to suppose, from the few instances related, that the 'commission' system has been pretty generally in vogue as a small graft. It was the custom to purchase supplies in Virginia City without inquiring what the price would be, and the mines paid higher prices than individuals. The powder graft is noticeable, not because of the amount of money abstracted, but because of the fact that no shame seems to be attached to it. Zadig & Co., stock brokers, are agents for the Hercules dynamite at Virginia City. They have formed a combination with the agent of the Giant Powder Co., who is a clerk in the employ of the mining companies of which Mr. Zadig is a director. Mr. Zadig cannot see any reason why he should not be a trustee for numerous stockholders, and a director in numerous mining companies, and should not at the same time charge his trustors 18c. per lb. on 13c. dynamite.

Much of the work of exploration on the Lode appears to be aimlessly done. It is not known today by the mine managers what can be done with the Comstock ores under modern metallurgical treatment, and at what expense. So far as practical work has gone, the firm of Chas. Butters & Co., cyaniding the Ophir tailing, has a monopoly of the present knowledge. There are some large bodies of low-grade ore above water-level, but what can be done with these is a question yet to be decided. Not a 'system-controlled' mine on the Lode has a mill of any description. In the work of mining, the Comstock Lode is far behind other districts. For driving and sinking, heavy drills made in Reno are used, though the porphyry does not require them. Light air-hammer drills for stoping, which have proved such a success in other camps, are unknown. The work at the Ward shaft is of great moment to the stockholders who are putting up the coin. More than $550,000 has been expended, but no definite program has been announced. The general opinion is that the work there is being done for the purpose of opening up the ground in the vicinity of that fatal drill-hole on the 2810-ft. level of the Exchequer which flooded Gold Hill in 1882. The only official reports at that time spoke of stringers of low-grade ore having been cut on the 2400 and 2810-ft. levels, but ever since that time dramatic stories have been in circulation to the effect that the drillings assayed high, and that a miner, fleeing before the steaming flood, carried in his hand a piece of bonanza ore. As a journalist, one well known upon the Lode, has remarked: "It is a difference of opinion that gives rise to horse-races." Whether the Ward shaft will proceed to use the big electric pump now being installed, for the benevolent purpose of draining an ocean of water from the Gold Hill mines, which are not contributing to the expense, or whether it will spend some more years in sinking to the 3100-ft. level, of which there is occasional mention, is unknown to the stockholders, although the Ward gets half their assessments. The practice of selling the Comstocks 'short' has had something to do with the laxity of management, and with the failure of the brokers to use their best efforts to make the mines pay. Not every speculator can sell the stocks 'short.' Only the brokers, and those to whom they wish to grant the privilege, can go 'short' of the market. A broker has in his office 10,000 shares of a certain stock, the certificates having been left with him by his customers. He may be holding them awaiting sale at a given price, or he may be holding them for a customer for the convenience of his paying the assessments on them, or he may have advanced money on them, or advanced the money to pay an assessment on them. The broker does with these certificates just as a bank does with its deposits. He figures that all of the 10,000 shares will not be called for at once, and that 5000 shares will meet all probable demands; so at the right time he goes 'short' of the market by selling the other 5000 shares for, say, 30c. per share. He can loan the $1500 thus received to his customers, and charge them good interest on it. The time for the inevitable assessment gradually approaches, and if a 'strike' has not been made in the mine, the price declines. For, without a 'find,' the stock is going to be worth about the same amount after this assessment is paid as it was after the last one was paid. The stock that was worth 30c. has a 10c. assessment levied on it, and slowly declines until on the day the assessment is delinquent it is worth about 20c. The next day, the 10c. assessment having been paid, it sells for 20c. plus 10c., or 30c. again. If the speculator is afraid to stay 'short' of the stock for a long time, because of possible developments, he buys back, when it is 20c., the stock that he sold at 30, and returns the certificates to the broker's office. He has thus made $500 by the transaction. If he stays 'short' of the stock at the time the assessment is delinquent, there are then only 5000 shares in the broker's office, while the customers send the money to pay the assessments on the 10,000 shares of stock deposited with him, being a total of $1000. The broker takes $500 into the office of the mining company, together with the 5000 shares, and has the certificates stamped "Assesment No. 23, Paid"; and he keeps the other $500 as his profit on the transaction. The people to whom he has sold the other 5000 shares pay the assessment to their brokers or to the mining company direct, and get their certificates stamped "Paid," and the 'short' has no responsibility in that regard. In other words, there are more assessments paid to the brokers and to the mining company direct, than there is stock in existence, by the amount of the stock that has been 'shorted' out of the broker's office. If a man is 'long' of a stock when a dividend is declared, he gets the dividend in cash; if a broker is 'short' of a stock when an assessment is delinquent, he gets the assessment in cash. As a confi-

dence game, 'shorting' the Comstocks is without a peer. The brokers on the inside can see to it that certain mines do not strike a bonanza, and as long as the stock does not go up, and force them to cover at an advanced price, there is no possibility of their losing, except through the stock being cornered. The business may seem trivial, but it is the nickels that make the street-cars pay. The Comstock mining companies collected $810,000 in assessments in 1907, and the further amount of assessments collected by the 'shorts' must have been no inconsiderable sum. Much of the financial history of the Comstock has been made by the 'shorts,' who have many times been cornered in the earlier days, causing a particular stock to jump hundreds of dollars per share without apparent cause. And then the price would fall again as rapidly as it rose. Some brokers, or their friends, stay permanently 'short' of the stocks for years at a time, just as a bank always has a part of its deposits loaned out. Of course, this system has evoked criticism. In 1877 the MINING AND SCIENTIFIC PRESS said: "A great deal of attention has been called of late to the custom among brokers of lending stocks not belonging to themselves, but to their customers. In many cases this is prejudicial to the bona-fide owners of the certificates. Now that so much public comment has been made concerning the practice, it is possible that some remedy will be applied." The difference between stockholders and stock-owners is an important one. In all cases in which the brokers act as trustees they are the legal stockholders, because their names are entered on the certificates and on the stock-books of the corporations. The people who have bought the stock-certificates, and who pay the assessments, are the stock-owners; but generally they do not become stockholders, in the sense above stated. They can not vote at the annual elections unless they obtain new certificates, made out in their own names. The majority of the stock-owners are not stockholders, and can not vote, therefore the directors ignore them.

The Comstock system is like a political machine. Every one connected with it is expected to work to get the names of the right men on the certificates as trustees. Then the trustees vote for the right board of directors, and the salaries are dispensed. Next the brokers put out their lines of 'shorts,' and then come the assessments and the profits. A few judicious reports from the system's managers on the Lode, in regard to certain work that is being done in a selected place, will boost the price up; and a few certificates borrowed from the customers' deposits in the brokers' offices will drive it down again. It is an ever revolving cycle. Trustees, salaries, shorts, and assessments. As long as the machine is preserved, and the public will take an interest in the stocks, there is no need to work the mines, as mines. Whenever the public refuses to pay assessments, it is necessary to find some ore and make a 'leader' in order to bring back the crowd. There are many personal antipathies among the brokers. They may have played their little deals against each other, and have had their quarrels; but up to 1908 they have all stood together like henchmen about a political boss in order to preserve the Comstock machine.

In the first few months of 1908 the assessment payers were tired out again. Some of them investigated and grew belligerent. Papers were prepared to take the matter into the courts; but the unexpected happened. Charles Hirshfeld, president of the Comstock Pumping Association and the Ward Shaft Association, also president of a string of Virginia mines, together with B. F. Shaw, another broker, invited certain assessment payers to take an interest in the management and to offer suggestions. Accordingly some new men were installed upon the directorates of the Mexican, Ophir, Con. Virginia, and Exchequer, without waiting for the annual elections. Their suggestions have been acted upon in certain particulars. There is now a committee of three to make purchases of supplies in the open market. Salaries have been cut, both in San Francisco and at Virginia City by all the companies in which Hirshfeld and Shaw are prominent, and the aggregate saving thereby is placed at more than $50,000 per year. It is agreed that each mine that has ore shall accumulate a fund whereby ultimately it can build its own mill; and exploration is now a little more active. But as soon as reform made an entry, all the forces of reaction commenced to gather and to get under steam. Some brokers had strongly objected to the stock-owners in the first place. The Gold Hill system would have none of them, and was resolved from the start to hold on to its ancestral perquisites, or to die with its boots on. The old system still controls the boards of directors of the Virginia mines, and the assessment-payers are only in the management on sufferance. If the men who are putting up the money to run the mines take an active interest in affairs, and take over the management of their own properties, then the Comstock is likely to have a genuine revival, and once more to become an important camp. This is true not only from the technical standpoint, but also from the speculator's standpoint, for every important boom in the Comstock that has lasted more than a few days has been based upon actual mining development. But as yet the revival is not assured. There is evidence that the reforms are not being accepted in good faith, and it would be strange if they were. Many brokers are known to have grown wealthy out of the old order of things, while the stockholders have been heavy losers. The Comstock has passed through a long and exciting history, but it has never yet been reformed.

Safety fuse is defined in the Western Australian 'Mines Regulation Act' as a fuse "which burns and does not explode, which does not contain its own means of ignition, and which is of such strength and construction that in burning it will not communicate laterally with other like fuses. Its rate of burning must not be less than 80 seconds nor more than 100 seconds per yard."

Butte heads the list of California counties in the production of the precious metals during 1907, the total being $2,795,807.

COMPANY REPORTS.

KERR LAKE MINING COMPANY.

This is an important silver mine at Cobalt, Ontario. The annual report covers the fiscal year ending August 31, 1908. During that period the production amounted to 1,473,712 oz. silver from 528 tons of ore. The gross value of the product was $787,554, the cost was $139,531, leaving an operating profit of $648,023, and a net profit of $484,536. The average gross value of the ore was $1502 per ton. Four veins yielded ore. The total linear development amounted to 5475 ft. The deepest shaft has reached 325 ft. only. Diamond-drilling was used successfully in prospecting. Dividends aggregated $360,000 during the year. Benjamin B. Lawrence, of New York, is the consulting engineer and S. R. Heakes is manager.

TOMBOY GOLD MINES.

The Tomboy is a famous mine situated in Savage basin, near Telluride, Colorado. The mill and mine are both on the edge of timber-line, at 12,000 ft. above sea-level. The original mine, to exploit which this company was formed, proved a disappointment; when the Tomboy 'petered out,' the manager, John Herron, obtained an option for his company on the adjoining claims, that now constitute the Argentine mine. By aid of the Argentine, the Tomboy was resuscitated and again ranked as a productive gold mine.

The report covers operations for the year ending June 30, 1908. During that period the mill treated 104,091 tons of ore, from which $999,021 of bullion was obtained, at a total cost, for mining and milling, of $534,206, so that the final profit was $464,815. Adding sundry rents and royalties, the total revenue was $1,012,502. The cost of mining and development was $3.27; of milling, $1.29; and of general expense, 57 cents. Thus the total expenditure was $5.13 per ton. Ore reserves are estimated at 410,000 tons, of which 58,000 tons is already broken in the stopes. During the year the addition of ore reserves kept pace with the extraction. The deepest level is at 2100 ft. below the outcrop. Two dividends were paid in the 12 months; these absorbed £90,000. The capital of the company is £300,000. This is one of the successful undertakings controlled by the Exploration Company, of London. D. A. Herron is manager. He is a brother of John Herron. It is pleasing to note that the accounts record a bonus of 1% on the profits for 1907 paid to John Herron, in recognition of his loyal service to the company. An honorarium of £500 was also paid to the present manager of the mine.

ALLIS-CHALMERS COMPANY.

The total earnings for the year ended June 30, 1908, after deducting cost of manufacturing and selling, taxes, insurance, and other general expenses, dividends on preferred stock outstanding of the Bullock Electric Manufacturing Co., and ordinary provision for doubtful accounts, were $2,573,960.93

Loss:		
Expenditures for maintenance, repairs and renewals on buildings, machinery, plant, tools, etc.	$778,476.64	
Reserves for depreciation on buildings, machinery, plant, tools, etc.	313,778.60	
Interest on bonds and notes payable	805,891.45	
Special reserve	60,000.00	
		1,958,146.69
Net earnings for the year..		$ 615,814.24

Inasmuch as, owing to present financial conditions, there may possibly be a shrinkage in the collection of certain bills receivable, it has been deemed advisable, out of abundant caution, to set aside out of the profits, on this account, the special reserve of $60,000 shown above. Beginning with the second quarter and continuing for half of the fiscal year, owing to the severe contraction in general business throughout the country, the volume of the Company's sales averaged about one-half of normal. During the last quarter there was a gradual and steady increase in orders booked.

MEXICO MINES OF EL ORO.

This is a young mine adjoining the Esperanza at El Oro, Mexico. It is under the same control and management as the El Oro Mining & Railway Co. Fergus L. Allan is superintendent; R. M. Raymond is general manager. The mine is capitalized for £180,000. A 40-stamp mill and cyanide plant was completed on October 1, 1907. During the ensuing nine months to the end of the fiscal year (on June 30, 1908) there was crushed 62,394 tons, yielding bullion worth $807,971, or an average of $12.95 per ton. The extraction of gold and silver averaged 84.4%, but the metal in solutions and precipitation-boxes brings the total estimated saving to 89.6%. The total cost of mining and milling was $6.33 per ton. In addition, 2038 tons of high-grade ore was shipped to smelters, yielding a net profit of $278,686, or $136.74 per ton. The total receipts were £237,096, and the resulting profit, after deduction of all expenses, local and at London, amounted to £132,096. Ore reserves are estimated at 205,310 tons, containing $11.72 in gold and 6.6 oz. silver per ton. The main shaft is down to the sixth level, but sinking has been resumed recently. The cost of mining is $2.86; of development, 63c.; of milling, 35c.; of cyanidation, $1.52; of general expenses, 31c.; the total is $6.33. The total tonnage was 64,432, and the total profit $640,665. This is an exemplary mining company.

NIGEL GOLD, TRANSVAAL.

The Nigel Gold Mining Co., Ltd., a company incorporated in Natal and operating on the Rand, at its twentieth annual meeting, held in Maritzburg, announced a working profit for the year of £92,254. Out of this dividends absorbing £66,931 have been paid. The Transvaal profits' tax amounted to £5500; extraordinary capital expenditure redemption, £5081; depreciation written off, £13,746. The mill crushed and treated during the year ended June 30 last 121,880 tons, and following the established policy of the company, development was carried on actively, adding 170,055 tons to the ore reserves. This represented the result from 7093 ft. of drifts, 1075 of raises, 786 of winzes, and 290 of cross-cuts. The total ore-reserves developed to date aggregate 491,073 tons, of which 214,073 assay above 8 dwt. per ton, and the remainder slightly less. The mill contains 55 stamps, which averaged an effective run of 341.9 days for the year, the per diem stamp-duty being 6.481 tons. The ore milled averaged 9.518 dwt. per ton, from which a recovery by amalgamation of 4.468 dwt. per ton was effected. The pulp entering the cyanide plant was separated into 77,214 tons sand, and 44,117 tons slime, assaying respectively 4.795 and 3.976 dwt. The theoretical and actual extractions from the sand were 87.044 and 94.886%, respectively, and from the slime 84.609 and 84.549%. The costs were:

	£	s.
Mining, including mine development....	14	11.610
Milling, including rock crushers.....	3	0.245
Surface transport	0	2.486
Cyaniding sand	2	4.512
Cyaniding slime	0	8.755
Extra capital expenditure	0	10.006
General charges	1	0.199
Total cost per ton milled.....	23	1.813

The Hendrie & Bolthoff Mfg. & Supply Co., Denver, in its October announcement, calls particular attention to the new line of small Corliss engines, of Murray Iron Works manufacture. It carries the 10 by 18 size in stock, and lays stress on its efficiency and small steam consumption. The new double tang drill socket is also described, this being a new device, made by the Cleveland Twist Drill Co., which allows a complete renewal of a drill which might otherwise be considered useless.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

ABANDONMENT OF MINING CLAIM—RE-LOCATION.

An actual abandonment of possession by a locator of a mining claim, such as would work an abandonment of any other easement, would terminate all the right of possession which the locator then had, and the ground embraced in such mining location would again become a part of the public domain, and render it subject to another location before the expiration of the statutory period for performing annual labor.

Farrell *v.* Lockhart, 28 Sup. Ct. 681, March, '08.

LABORER'S LIEN ON MINING CLAIM.

The Alaska code giving a lien to laborers for work done on a mine at the instance of the owner or his agent, was held sufficient to give a lien on the interest of the owner of a mining claim for improvements made thereon under the directions of a lessee, with the owner's knowledge, and in the absence of any disclaimer of responsibility by him. And in an action to foreclose such lien in such case, the lessee is not a necessary party.

Cascaden *v.* Wimbish, 161 Fed. 241, April, '08.

FRAUDULENT SALE OF MINING STOCK.

The owner of mining stock induced a third person to purchase by fraudulently representing that the stock purchased was to be treasury stock; but instead of treasury stock he transferred to the purchaser his own private stock. In an action for damages, it was held that, inasmuch as treasury stock under any circumstances is worth neither more nor less than any other stock, the damages were wholly speculative, and there could be no recovery. The Court intimated that if the purchaser had acted promptly he might have rescinded the sale, re-assigned the shares, and recovered the purchase money from the person to whom he paid it.

Findlater *v.* Dorland, (Mich.) 116 Northwest. 410, May, '08.

LOCATION OF MINING CLAIMS—OVERLAPS.

A mining company located a claim, and thereafter on the same day located another claim, the latter overlapping a part of the former. The various acts requisite to a valid location were first performed on the claim first located, and subsequently on the claim last located. Under such circumstances the first location constituted the senior location, and the overlapped, that is, the disputed territory, was a part of such first claim, and was thereby segregated from the public domain. On the abandonment of such first location, by reason of the failure to perform the annual assessment work, such overlapped territory did not become a part of such second claim, but reverted to the public domain, and was subject to re-location. Thereafter a third person located a claim which included such conflict-territory, and took the necessary steps for a valid location. In a contest as to the right to such overlapped territory the person making the last location had the title to such conflict-territory.

Moorhead *v.* Erie Mining & Milling Co., (Colo.) 96 Pac. 253, June, '08.

MINING CLAIM—PERFORMING LOCATION WORK.

The purchaser of a mining claim did no work thereon except the digging of a hole to show his claim of possession, and for the purpose of erecting a drilling machine, and not as a mining exploration; he did not take a drilling machine on the premises for more than a year after the digging of such hole, but guarded the claim to prevent others from entering thereon for the purpose of location. In the meantime a third person entered upon the land and made a valid discovery and location, and as against this discovery and location the original purchaser was not in such actual possession of the land as to entitle him to the claim as against such third person.

Whiting *v.* Straup, (Wyo.) 95 Pac. 849, May, '08.

Guggenheim Operations.

Some unfortunate investments of the Guggenheim interests in the mining line are just coming to light, and explain in a measure why there has been such a house-cleaning in the field forces, for the purchase of these properties was largely upon the recommendation of the highest paid mining engineering talent in the country. The Guggenheim Exploration Co., which is the principal mine owner of the Guggenheim outfit, has expended a total of $27,000,000 in acquiring properties within a comparatively few years.

One of the leading mining assets of the Company was the property at Velardeña, Mexico. This was a silver-lead group, and was operated privately for years by Barton Sewall and associates, known as the old American Smelting & Refining crowd. The property produced between $8,000,000 and $10,000,000 from the old silver-lead ground from carbonate ores. Then no zinc had appeared in the ores, and smelting costs were exceedingly low, and it was possible at that time to derive excessively large profits in treatment of custom ores. The Sewall interests sold the properties to the Guggenheims for $6,000,000, and they expended $1,000,000 in a new furnace plant and $400,000 on a new power plant. At the same time they purchased a copper property, 16 miles distant, and built a railroad to connect it with the Velardeña plant, so that the total investment at this point amounted to not far from $10,000,000. Soon after the Guggenheim control, however, arsenic came in the ores, and operating conditions changed so that it is now said that there has not been a dollar of profit derived to date on this investment. At the copper mine they went down 600 ft. and found that the ore is practically exhausted, running at the lower levels but 1¾% copper. Here is a $10,000,000 investment which could probably not be re-sold for over one-tenth of the cost. Velardeña is now a fighting word in the Guggenheim offices.

A second pronounced Guggenheim failure was a silver-lead property near Silverton, Colorado, for which $2,500,000 was paid for the mine, and an additional $750,000 expended in a new mill and equipment, only to discover, when the mill was ready to operate, that the mine was practically out of ore.

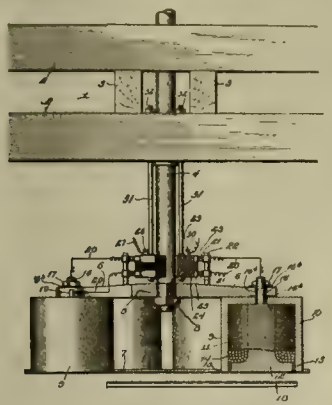
The Guggenheims likewise have a $7,000,000 investment in the Yukon, but the public was given an opportunity to help shoulder this burden. The selling of the shares was given to Lawson, who was given an option upon 700,000 shares at $5 per share. The Yukon flotation—some people call it by a harsher name—resulted in 400,000 shares of the company being distributed to the public at from $6 to $8 per share. The distributor got his stock for $5 per share net, but as he had previous to the public offering distributed 200,000 shares among a favored few at 5½, he was obliged to take this stock back in the open market at from $6 to $8, so that the net Lawson profit was ⅝ of a point on the 400,000 shares, or $270,000. The Guggenheims paid the advertising bills of about $80,000, and received an acknowledgement in the shape of an immense bunch of Lawson pinks sent to the *Mauretania* when Daniel Guggenheim sailed for Europe shortly after the Yukon flotation.

Another chapter could be written of the Guggenheim investment for the American Smelting Securities Co. of between $8,000,000 and $10,000,000 in the three smelting plants on the Pacific Coast. These included the Tacoma plant, for which $4,000,000 was paid, or many times the price at which the same plant had been offered to other interests six months previous to the time the Guggenheims purchased it. The Selby plant, on San Francisco Bay, cost almost as much as the Tacoma plant. It is not now productive of earnings, because it is shut down tight, the agricultural interests having secured a permanent injunction against its operation because of the smelter fumes. A third was the San Bruno plant, which was to have been built on San Francisco Bay, at a cost of $7,000,000, but was abandoned after an expenditure of $1,500,000 because of court injunctions from the agricultural interests.—*Boston News Bureau.*

MINING AND METALLURGICAL PATENTS.

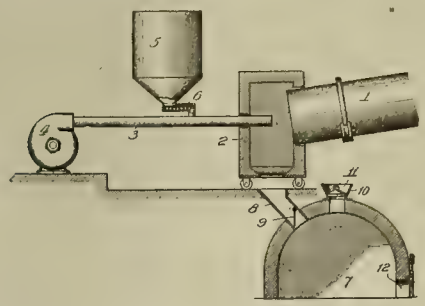
Specially reported for the MINING AND SCIENTIFIC PRESS.

MAGNETIC ORE-SEPARATOR.—No. 899,348. Charles E. Stebbins, Iola, Kansas.



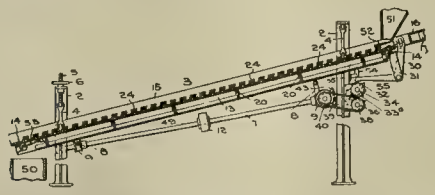
In a magnetic ore separator, the combination of a main support, a shaft journaled therein and depending therefrom, supporting rods also depending from said main support and arranged about said shaft, a head fixed upon the lower end of the shaft to rotate therewith, a series of electro magnets carried by said head, brushes carried by the head and in electrical connection with the magnets, an annular commutator inclosing the shaft above the head for co-operation with the brushes and provided with a gap adapted to be crossed by the brushes, said commutator having arcuate openings through which said supporting rods extend, whereby the commutator is adjustable circumferentially on the rods to vary the position of the gap, means for securing the commutator to the rods in adjusted position, and electrical conductors for connecting the commutator with a source of electrical energy.

METHOD OF TREATING ORE.—No. 899,405. John T. Jones, Iron Mountain, Michigan.



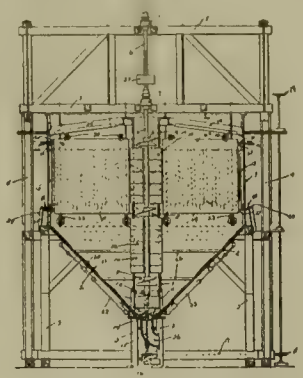
The method of reducing ore which consists in heating a mass thereof to a high temperature without melting it, then subjecting the heated mass, under confinement, to contact with fresh hydro-carbon fuel, distilling the fuel by the heat of the ore and thereby generating a deoxidizing atmosphere to react upon the ore and reduce metallic oxides to metal.

ORE-SEPARATOR.—No. 900,581. Joseph F. Pagett, Denver, Colorado.



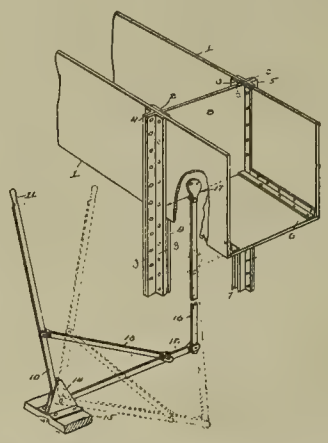
In an ore separator, an inclined trough including longitudinally disposed air flues, and a plurality of transverse hollow riffles upon the plate connected with the said flues, the said riffles having air outlets in one of their sides.

COMBINATION AGITATOR AND DECANTING FILTER.—No. 899,489. Wilbur A. Hendryx, Denver, Colorado.



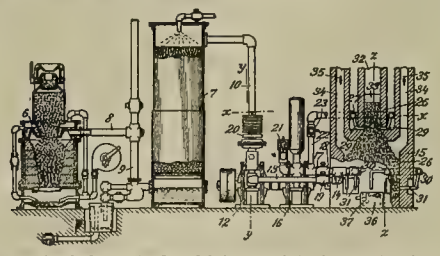
Apparatus for treating ore-pulp, comprising a tank, means for circulating and aerating material therein heating, means for the circulating material, a plurality of filter cells in position to be submerged in the material in said tank, and means for withdrawing liquid from the tank through said cells.

ORE-CHUTE.—No. 899,076. John Ross, Landlock, Alaska.



In a chute, the combination with a chute proper, having side walls and a bottom section, of ways positioned interiorly on said walls, angle irons positioned exteriorly on said walls forming a bracing thereof and a vertical extension for said ways, a chute section extending away from said ways provided with an opening in its bottom portion in line with said ways, a gate slidably mounted in said ways, a link pivotally connected with said gate, a lever pivotally engaging said link, and independent means for supporting said lever.

METHOD OF SMELTING COPPER ORES.—No. 900,346. George H. Benjamin, New York, New York.



The method described, which consists in subjecting within a furnace structure a body of ignited sulphide ore to the action of a flux and an oxidizing atmosphere, and the oxidized body derived therefrom to the action of a reducing atmosphere of high temperature.

Publications Received.

METALLURGY: A CONDENSED TREATISE. By Henry Wysor. 8vo., pp. 308. Ill. Easton, Pa. The Chemical Publishing Co. 1908. Price $3. For sale by the MINING AND SCIENTIFIC PRESS.

There is a perennial need for brief treatises on metallurgy to afford a ready means for non-technical readers to acquire familiarity with the outlines of modern methods. Since the publication of Hiorns' excellent little manual, some twelve or fifteen years ago, the field has remained uninvaded by any other brief treatise conceived in the scientific spirit. It is admitting a high degree of excellence to say that Mr. Wysor has given us a work that will rank alongside of Hiorns', with the advantage of being up to date. This is a difficult achievement for any technical book, which is usually out of date as soon as printed. So swiftly does technology change that Mr. Wysor has suffered in like manner, no mention being made of the application of the cyanide process to silver ores, which method is fast driving out every other, except in the cases of argentiferous copper and lead ores. The book is particularly strong in its treatment of fuels, and in the metallurgy of iron and steel, as would be expected in a work by an assistant professor in Lafayette College. In these departments it is certainly imforming and modern, giving facts which all iron and steel users should know. The book should appeal to a large class of readers, and would be excellent as a syllabus for a course of college lectures.

STEAM POWER PLANT ENGINEERING. By G. F. Gebhardt. 8vo., pp. 855, Ill., Index. New York. John Wiley & Sons. 1908. Price $6. For sale by the MINING AND SCIENTIFIC PRESS.

The peculiar function of this book is to provide in convenient form a complete review of all the elements entering into the problem of installing and efficiently operating a modern steam-plant. It is not exhaustive in regard to any one of the many subjects treated, but it gives practical data and working formulas, so that it constitutes a handbook sufficient to enable one to cope effectively with difficulties as they arise, even though further data be unavailable. An excellent discussion of fuels is given, which deals elaborately with coal and fuel-oil, and with such substances as peat, wood, straw, saw-dust, and bagasse. The presentation of methods for the use of fuel oil is particularly commendable. Boilers are treated in some detail, with special reference to selection and maintenance. Methods of smoke-prevention, involving a description of leading types of mechanical stokers, constitute an interesting chapter. Other subjects treated are superheated steam and superheaters, coal and ash-handling apparatus; chimneys, their design, construction, and efficiency; mechanical draft, condensers, water-feed purifiers and heaters, pumps, separators and traps, piping and fittings, lubrication, testing, and so forth. The discussion of the turbine engine is quite full and interesting, but the reciprocating engine is disposed of more summarily. The general accessibility of data on the steam engine is sufficient excuse for the brief treatment given. The book excels in the exposition of the accessories to a steam power-plant, which are discussed in a way that will prove particularly useful to those engineers who have to grapple only occasionally with steam-power problems. The explanation of the steam indicator and the interpretation of indicator-diagrams, and the apparatus and methods for dynamometer tests, is especially concise and clear. Simplicity and clarity of statement characterize the book throughout, and it is full of the facts that the practical worker needs. It is handsomely printed and profusely illustrated with detail drawings. Every steam-user's library should contain a copy.

THE MOUNT FARRELL MINING FIELD. By L. K. Ward. Geological Survey Bulletin No. 3 of the Tasmania Department of Mines.

Records With the Wood Drill.

In driving a 2000-ft. tunnel, 7 by 12 ft., in the Pine Brook mines of the Scranton Coal Co., at Scranton, Pa., two 3-in. Wood drills were used. These drills have a stroke of 6½ in. and will drill to a depth of from 10 to 14 ft. The drills were worked in 8-hr. shifts. The average depth of hole driven by each machine in one shift was 127 ft., thus drilling nearly 16 ft. per hour. The tunnel was through the hardest rock encountered in mining in these coal fields. Although the work was severe, the cost of maintaining the drills was small. For the two drills the total amount spent for repairs and renewals was $15.95, the details being: two feed screws with nuts complete, 12 sets of piston packing, 6 sets of piston-ring springs, 6 doz. rachet springs, and 2 doz. chuck bolts. These are the parts in any well made drill that wear out under ordinary conditions. This gives a cost for maintaining one No. 3 drill of about $8 for the drilling done in the excavation of about 3100 cu. yd. of rock, the number of feet drilled per cubic yard excavated being more than in open-cut work. The No. 3 Wood drills do excellent work in shaft-sinking in what is termed 'blocky ground.' The Scranton Coal Co. mines some coal from veins that are from 2½ to 3 ft. thick. It is necessary to blow the roof down or take up the bottom. This work was formerly done by hand, and in 8 hr. two men seldom drilled more than 2 ft. in the roof. Now the company uses No. 2¼ Wood drills, with two men to each drill. These move from room to room as they are needed, and drill from 60 to 75 ft. of hole in 8 hours.

Commercial Paragraphs.

THE CALIFORNIA ORE TESTING WORKS is in receipt of a consignment of ore from the Nevada-Wonder, at Wonder, Nevada, with a view to making a complete test as to best metallurgical treatment.

THE BUTTERS FILTER CO., San Francisco, advises that it has recently closed a contract for the installation of a 90-leaf Butters filter at the Jesus Maria mill of the Guanajuato Amalgamated Mines Co., at La Luz, Mexico.

The CLEVELAND ROCK DRILL CO. has been incorporated as a subsidiary company to the Cleveland Pneumatic Tool Co., and will handle the business of the mining department, which has greatly increased since the parent company entered the rock-drill field.

DANIEL BEST, for many years at the head of the Best Manufacturing Co., of San Leandro, California, has retired in favor of his son, L. C. Best, who has been elected president of the Company. The Best traction engines are well known in almost every part of the world.

Catalogues Received.

The ALLIS-CHALMERS CO., Milwaukee, will be glad to send its Bulletin No. 1433, called 'Prospecting-Mills for Free Gold Ores,' to anyone who is interested.

THE JEFFREY MFG. CO., Columbus, Ohio, has published, under date of September, 1908, its Bulletin No. 27, descriptive of coal washing plants and equipments.

The W. S. ROCKWELL CO., New York, has recently issued a small folder showing its crucible melting furnace, in which either oil or gas may be used as fuel.

The KEYSTONE DRILLER CO., Beaver Falls, Pa., are distributing catalogue No. 7, which is a description of the new gasoline drilling machines now put on the market by that well known firm.

The MACINNIS GALVANIZED STEEL FLUME CO. has recently issued, through its sales agent, T. C. Egleston, Denver, Colorado, an elaborately illustrated description of galvanized steel flumes for irrigation, power, and mining canals.

The ABBE ENGINEERING CO., New York, has recently published Catalogue No. 4, which is a complete description of the different pebble mills handled by the firm. With it is distributed a small folder on modern mixing machinery.

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EDITORIAL.

ACCORDING TO a published statement of the postmaster of New York, the two-cent rate of postage, which went into effect on October 1, has already doubled the volume of foreign mail transmitted from, and to, New York.

REFERRING TO a question of correct usage in addressing a fellow citizen of this great Republic, we rise to inquire whether it was proper for the agent of the Standard Oil Company, when enclosing a check for $10,000 to the Attorney General or general attorney of the State of Pennsylvania, to address that gentleman as "General" and "Honorable".

AT BENDIGO, in the Australian State of Victoria, the Victoria Reef Quartz Company has found gold-bearing ore at a depth of 4504 feet, in a winze sunk from the 4254-foot level. Native gold is plainly visible, associated with iron pyrite. Apparently the ore forms part of the cap of a saddle reef and it will be necessary to sink the main shaft—now 4300 feet deep—in order to extract this ore profitably. *The Australian Mining Standard* claims this to be the deepest discovery of gold-quartz ore in the world and we believe the claim justified.

RAILROAD BUILDING in northwestern Canada is likely to develop new mineral regions. The line from North Bay to Temiskaming and thence to James Bay, at the southern end of Hudson Bay, will aid the exploration of the northern portions of the provinces of Quebec and Ontario. The Grand Trunk & Pacific will have a branch to the west end of Hudson Bay and will cross the Rocky Mountains in reaching to Port Simpson, on the Pacific coast. The United States Steel Company has put prospectors along the surveyed route of this new trans-continental railroad; during the summer they have been about Lake Nipigon and the adjacent country. There exists a spacious wilderness in this part of the American continent and it has mineral possibilities. New mining developments are likely to be heralded from this quarter.

QUOTATIONS of 5 and 10 cents for Greene Gold-Silver Company stock, coupled with the practical retirement from business of the man whose name was given to this, and to other enterprises in Sonora, accentuate the fact that W. C. Greene has run the gamut of prospector, promoter, and financier. The Colonel's withdrawal from New York to Cananea and his ill health are coincident with the practical collapse of enterprises undertaken four years ago in a spirit of flamboyant recklessness. It is no new story. The man who is an energetic and

successful prospector, the pioneer of frontier enterprise, and a mining adventurer—giving the word its old and romantic significance—is apt to become an ill-regulated and irresponsible promoter when he gets into the hands of the gentry who live by the exploitation of the simple and greedy. The explorer is rarely a business man and the prospector is rarely a successful promoter.

OUR CORRESPONDENT at Guadalajara mentions the fact that the Amparo Mining Company has contracted for the planting of half a million eucalyptus trees. This plantation will, in a few years, furnish timber for use underground. We commend this provident enterprise. It should prove profitable. Similar plantations in South Africa and California have furnished valuable material for mines.

REVIVAL OF INTEREST in gold dredging is manifest in several directions. Some of the evidence indicates honest industry, some of it suggests spoofery. In the September issue of *The Review of Reviews*, of London, there are several pages of drivel concerning the "gold ship," "the sands of Pactolus," "the modern El Dorado," and so forth, these glittering phrases, like the lights on a child's Christmas tree, being hung about a so-called "character sketch" of "a popular speaker, a campaign orator," and a promoter who "has added to his other activities the Apostolate of the Gold Dredge." It is balderdash of a superlative kind, a write-up of a most meritricious character, and proof that *The Review of Reviews* has become a second-class periodical; but the expense involved in this dishonest form of advertisement indicates the belief that there is a public interest in dredging. That is the only significance of the article.

APPRECIATION of stocks since the culmination of the panic, twelve months ago, has progressed so far that in railroad shares it reaches from 10 to 75 per cent, and in industrials from 40 to 160 per cent of the quotations at that date. This is about the time when the powerful speculators in control of the market let go their stocks to the public, which is now being fed with optimistic statements concerning industrial activity and financial recovery. Such statements are, fortunately, largely true, but the prices of stocks have discounted the fact already. We shall see the old and familiar game of a stock boom in the course of which the public will buy from the big operators the shares purchased during the days of panic; then will come another reaction, and the schemers on Wall Street will buy back to sell again when another boom comes, and so on. History repeats itself.

THE PROSTITUTION of journalism in the interest of stock-jobbery was illustrated in a typical way by recent proceedings in the Bay Street Police Court, before whose historic bar moral delinquency has been brought to account time out of mind. The defendant was described as "the editor of a financial newspaper called *The Critic*. He was also the proprietor of a Stock Exchange speculative agency called The Critic Agency, which was conducted by him in connection with *The Critic* newspaper. He was the sole director of three syndicates and two companies distinguished by the name of 'Common Weal'." Later, the prosecutor said that "*The Critic*, newspaper, of which the defendant was the editor-in-chief, posed as the champion of investors, the champion of honest criticism in the public press, and the opponent of dishonest persons connected with company promotions. On the heading was a quotation: 'I am nothing if not critical.' . . . It was quite clear that the defendant posed as the champion of the investing public at the time he was now alleged to have been defrauding them." In short, it was one of very many pseudo-literary squibs whose motto should be: "I am nothing if not a blackmailer." Usually such papers are nothing, and when they are anything it is only because some people are ignorant and others are afraid. Owing to the vast and varied character of the financial activities in motion within the boundaries of the City of London there is plenty of scope for papers of *The Critic* class. One of them is, or was (for we do not know whether it exists any longer) the *Anglo-Colorado Mining & Milling Guide*, a pitiful little sheet that undertakes, or undertook, to give advice to investors when not engaged in blacking the boots of one man or blackening the character of another.

Justice and Law.

It has been said that morality is a matter of latitude, although doubt may well exist concerning any coincidence of isothermal and isomoral curves. Curves are inherently immoral if a straight line be accepted as the symbol of rectitude. But these verbal sinuosities should not be followed to their limit, for they end in a maze. They are prompted by reading, in *The Australian Mining Standard*, an account of the proceedings in the Federal High Court sitting at Melbourne on September 17. A mining company had brought suit against a broker for "the sum of £500, and the value of 320 shares in the company, on the ground that, being a promoter of the company's flotation, the defendant had received these as commission, or profit, without disclosing that fact to the directors and shareholders." His Honour found that "defendant was bona fide a promoter of the company from first to last, and that the amounts had been illegally and secretly obtained." We quote our contemporary. His Honour proceeded to make some severe remarks on the transaction: "The defendant says that such bribing of directors is a 'custom' in forming mining companies. This is a startling avowal with regard to a leading Australian industry, especially as coming from the president of one of the chief exchanges. But if the practice of bribery is so rife in the promotion of mining companies it is well to have it made public; and it is my unpleasant duty to expose, as far as the evidence allows me, what has been done in this case, and to say that in no circumstances can such a 'custom' be treated as legitimate. This is not a

court of morals, but it is a court of justice according to law; and as such it condemns both the giver and the taker of a bribe." "A Daniel come to judgment," indeed; we salute Mr. Justice Higgins and congratulate a community that is served by such a man. To a dweller in San Francisco this plain statement is as a drink of cool clear water in a dust storm. Here by the Golden Gate they spin fine distinctions between the giver and the taker of bribes; they do the same at New York, St. Louis, and Philadelphia. Evidently human nature is made out of the same frail substance at Melbourne as in San Francisco, but the strong judge, able to administer "justice according to law," is scarce in both localities. We get law without justice and we get justice without law. Civilized government rests on the closest possible interpretation of one in terms of the other; lacking such interpretation, we have anarchy.

Investment and Speculation.

Our friend *The Canadian Mining Journal*, takes exception to some recent remarks appearing in these columns in which the speculative feature of mining was emphasized. Other contemporaries have objected to this emphasis, recognizing in the word 'speculation' something malign as compared to the dignified term 'investment.' It is largely a matter of usage. People have fallen into the way of using 'investment' for ventures that are really speculative, and 'speculation' has been fouled by the vagaries of irresponsible adventurers until it is a word of ill omen. Let us return to correct definitions. No discussion is profitable unless preceded by agreement as to the meaning of the terms employed. Even dictionaries are not inerrant, for they are the work of human beings. Thus the Century says that 'investment' is "a placing or conversion of capital in a way intended to secure income or profit from its employment." This is badly expressed; the one valuable idea is the connotation of income as a sign of investment. The Standard says that it is "laying out money productively, especially in a permanent manner." A manner cannot be permanent; as well fossilize an adverb or petrify an attitude while releasing the actor. But here we get the idea of productivity, that is, the placing of money so that it shall yield an income. The further suggestion is made that such money shall remain thus placed for a long period; the element of time is introduced. This is correct. However safe and sound the use made of money, it is not regarded as an 'investment' if it is to be withdrawn next day. Thus we arrive at the definition of 'investment' as the placing of money for a period in the expectation of a regular income therefrom. No reference is made to enhancement of the principal, it is the dividend that attracts; the safety of the principal is assumed. We shall see that in 'speculation' the position is reversed, the enhancement of the principal becoming the chief factor, while the question of a regular income is subordinated. The Century defines 'speculation' as "the investing of money at a risk of loss on the chance of unusual gain." The only objection to this otherwise excellent definition is that it defines one word in terms of the other one with which we are contrasting it, so that the presence of "investing" is undesirable in a definition intended to distinguish between 'investment' and 'speculation.' Turning to the Standard, we find that 'speculation' is "a more or less risky investment of money in expectation of considerable gain." The "more or less" is idle, and "investment" is open to the objection already made. Both dictionaries recognize risk as an essential and both connote the 'gain' with the 'risk.' We venture to define 'speculation' as the placing of money in a risky venture in the expectation of unusual gain. The expectation involves an increase of the principal and usually disregards the yield from dividends, the latter being important rather for the effect of enhancing the value of the principal than for their own sake. A test between an 'investment' and a 'speculation' is the willingness to take the papers that stand for them and put them in a safe for a term of years. Men 'lock up' an investment but they hold a speculation ready for quick realization. Thus British consols and United States bonds are 'locked up,' only to be removed temporarily at regular intervals when a coupon is to be detached; the owner does not buy them in the expectation of a big rise in the quotation, he values them mainly because they yield a regular and absolutely assured income. Thus also with a few of the best railroad bonds and even with the debentures of some mining companies. But it is possible to speculate even in bonds; there are brokers and others who buy and sell bonds for the sake of the fluctuation in the market price rather than for the dividend, which may not change. The investment of one man becomes the speculation of another; the one buys to hold and to win an income; the other buys expecting to sell at an enhanced price, before a dividend becomes due. On the other hand, a speculation may gain in stability so that the conditions favor a regular income without disquieting fluctuation in the amount of the principal, until finally the money involved returns a regular yield, while the quotation remains steady; then the purchase or holding of that stock becomes based more on its yield as an investment than on its enhancement as a speculation. The shares of a few mines belong to this category, although most mines are essentially speculative. The Canadian editor quotes farming and building construction as forms of industry that are speculative. They are; some of them. Any use of money can be made speculative by taking risk in the expectation of unusual gain. "No industry is free from the effects of human errors," says the gentleman at Toronto. That is true, nor is it disgraceful to err, save to make the same blunder in the same way twice. "Mining should be a business in the strictest sense of the word," but this assumes that speculation is divorced from business. That is incorrect; business and speculation were married long ago; they are indissolubly bound. Mining is one of the best of the businesses in which man engages, and it is speculative because the risk involved is compensated by unusual gain.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

ALLEN H. ROGERS is in Chile.

F. W. BRADLEY is at Elk City, Idaho.

J. R. FINLAY has returned to New York.

CHARLES BUTTERS has returned from Mexico.

SCOTT TURNER left Nome for Seattle on October 22.

MARTIN SCHWERIN, of New York, is in San Francisco.

E. A. WEINBERG was recently at Cloncurry, Queensland.

F. C. ALSDORF, of Globe, Arizona, is in San Francisco this week.

THEODORE DOUGLAS was married at Greenwich on October 7.

O. H. PACKER is examining copper mines at Yerington, Nevada.

T. LANE CARTER is expected in San Francisco about November 1.

J. POWER HUTCHINS arrived in San Francisco this week, from Idaho.

GEORGE JAMME has returned to Seattle from southern California and Nevada.

ZEBINA LANE is returning to Australia, after a ten months sojourn in California.

H. FORBES JULIAN has returned from Mexico and will be going to London soon.

LANE C. GILLIAM spent the season in Alaska and has returned to Los Angeles.

W. B. LAMB, of Lamb, Wainwright & Co., Los Angeles, is in British Columbia.

ALBERT BURCH returned from Mexico this week and has gone to Wardner, Idaho.

OLIVER B. FINN has been examining the Gold Reef mine, near Philipsburg, Montana.

F. L. JOHNSTON is at Santa Barbara, Cal., and will go shortly to northern Mexico.

GEORGE J. BANCROFT announces the removal of his office to 222 McPhee Bdg., Denver.

H. E. T. HAULTAIN has been appointed associate professor of mining in Toronto University.

E. M. HAMILTON was married in England recently and is expected in San Francisco shortly.

E. H. GARTHWAITE has returned to Oakland from the examination of mines in Sinaloa, Mexico.

HENRY LEIGH HUNT passed through San Francisco, on his way from Wardner, Idaho, to Sonora, Mexico.

Obituary.

HENRY AUGUSTUS BUTTERS died at Berkeley, California, on October 26. He was born at Haverhill, Mass., 58 years ago. Acute congestion of the lungs proved fatal, after a brief illness. He came to California at the age of 14, and after attending the old College of California he was employed by Bancroft & Co. In 1878 he went to Leadville, Colorado, and engaged in mining, gaining experience that proved invaluable. In 1891 he went to South Africa, and became the successful promoter of an urban electrical tramway system at Johannesburg. Gaining the support of Wernher, Beit & Co., he was able to organize syndicates for the successful installation of tramways in Switzerland, Mexico, and South America. Thus he became rich. In 1895 he returned to Oakland, where he had a beautiful home. He organized the Northern Electric Co. and became heavily involved after the San Francisco disaster. This depleted his fortune and caused domestic troubles which clouded the last years of his life. He is survived by his brother Charles, by a wife, a boy of 15, and several stepchildren. His sudden death has evoked many expressions of regret and esteem.

Latest Market Reports.

LOCAL METAL PRICES—October 29.

Antimony	12@16c	Quicksilver (flask)	$44@45
Casting Copper (scrap)	8½@13½c	Spelter	6¼@7c
Pig Lead	4.55@5.50c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Oct. 22. £. s. d.	Oct. 29. £. s. d.	
Camp Bird	0 14 0	0 15 0	
El Oro	1 5 0	1 3 9	
Esperanza	3 5 6	3 3 9	ex div.
Dolores	1 10 0	1 10 0	
Oroville Dredging	0 9 9	0 9 0	ex div.
Stratton's Independence	0 1 0	0 1 0	
Tomboy	1 1 3	1 0 7½	

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Oct. 23	13.38	4.26	4.80	51¾
" 24	13.38	4.26	4.80	51⅜
" 25	Sunday.	No market.		
" 26	13.38	4.28	4.80	51⅜
" 27	13.50	4.28	4.83	51¼
" 28	13.50	4.31	4.83	51¼
" 29	13.56	4.31	4.83	50⅞

MINING STOCK QUOTATIONS—NEW YORK.

Closing prices.

	Oct. 22	Oct. 29.
Amalgamated Copper	79¾	80¼
American Smelting & Refining Co.	90¾	93½
Boston Copper	13⅞	14½
Butte Coalition	26¾	26¾
Cumberland Ely	7¾	8⅛
Dolores	7¾	7½
El Rayo	4⅛	4⅛
Giroux	4	4
Greene-Cananea	10⅛	10½
Indiana Sonora	5⅛	5⅛
La Rose	6⅜	6½
Miami Copper	10⅝	11⅝
Nevada Consolidated	16⅞	17¾
Newhouse	4½	5
Nipissing	9⅜	9½
Ohio Copper	½	4
Tennessee Copper	44¾	46½
Utah Copper	42⅞	43⅜
Yukon	4½	4⅜

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, October 29.

Atlanta	$ 22	Laguna	$ 1.10
Belmont	1.22½	MacNamara	53
Booth	40	Manhattan Con	5
Columbia Mtn	22	Midway	26
Combination Fraction	1.22½	Montana Tonopah	83
Daisy	98	Nevada Hills	1.62½
Fairview Eagle	25	Rawhide Queen	63
Florence	3.97½	Sandstorm	25
Gold Bar (Bullfrog)	4	Silver Pick	16
Goldfield Con	6.35	St. Ives	27
Gold Kewenas	30	Tonopah Extension	58
Great Bend	35	Tonopah of Nevada	7.15
Jim Butler	23	Tramp Con	16
Jumbo Extension	31	West End	52

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. October 29.		Closing prices. October 29.
Adventure	8	Mohawk	66½
Ahmeek	105	Nevada Con	17⅝
Allouez	37½	North Butte	——
Amalgamated	80	Old Dominion	50
Arcadian	3½	Osceola	118½
Atlantic	18½	Parrot	27¾
Boston Con	——	Quincy	92½
Butte Coalition	26¾	Rhode Island	4¼
Calumet & Arizona	119	Santa Fe	1¾
Calumet & Hecla	660	Shannon	16
Centennial	34½	Superior & Pittsburg	16⅝
Copper Range	77½	Tamarack	74
Daly-West	9	Trinity	17¾
Franklin	13¼	United Copper Con	11⅛
Granby	98	Utah Copper	43⅜
Greene-Cananea, ctf	10⅝	Victoria	5
Isle Royale	23	Winona	5
Mass	5¼	Wolverine	140

General Mining News.

ALASKA.

Reports from Fairbanks state that the famous Dome Creek case has been settled out of court. The settlement leaves the Dome group association in undisputed possession of the paystreak on Dome creek on 1, 2, 3, and 5 Below. For a consideration of $115,000 all rights in claims No. 1 and 3 first tier, right limit, are relinquished in favor of the locators of the Dome Group Association claim. This same association quieted title to No. 2 last year by the payment of $25,000. The question of the title to lower 4 and 5, second tier, is now in the Court of Appeals, but the outcome of that case will not affect the actual possession of the property. Of the $115,000 involved in the settlement of No. 1 and 3, $25,000 was paid in cash; for the rest a mortgage was given on No. 1, which will mature on July 15 next year.——J. L. McPherson is in Alaska in the interests of the Alaska Road Commission, which is planning to build a railroad between Seward and Nome. It is understood he will recommend the building of a road from Kaltag to the Innoko to be a part of the trans-Alaska system.——The Alaska Chief mine, which is owned by a company composed of prominent Nome people, is about to be re-opened, and Milton Luther, with a party of men and an outfit, has been sent up to commence work.

ARIZONA.

COCHISE COUNTY.

The shaft on the Warren property has reached a depth of 815 ft. and is still in dry close-grained limestone carrying considerable iron stain. The shaft is perfectly dry and shows no indication of water. The group is east of the town of Warren.

PIMA COUNTY.

The management of the Helvetia has decided to ship its sulphide ores to custom smelters rather than to remodel the old smelter. Accordingly shipments have been started to the Old Dominion, at Globe, and will continue at the rate of 100 tons per day.

SANTA CRUZ COUNTY.

The Pittsburg camp, in the Santa Rita mountains now looks very much like a mining camp. The boiler, hoist, pump, and air-compressor are all in place and in operation. The shaft has been timbered and sinking has been resumed after a delay caused by waiting for the machinery. The shaft is about 90 ft. deep and going down at a rate of four feet per day. About 20 men are employed.

YAVAPAI COUNTY.

(Special Correspondence).—The old Vulture mine, which has recently passed into new hands, is employing about 30 men at work improving roads and repairing the buildings, in preparation for the further opening up of the mine and starting the mill. The boilers and much of the machinery for the new electric power plant have arrived. The plant is being erected on the grounds of J. B. Holland, one-quarter of a mile east of Wickenburg. The new plant, which will supply power to mines in the surrounding country and furnish lights for Wickenburg, will cost more than $250,000, and will generate from 1500 to 2000 hp.——A 40-stamp mill will be installed at the Monarch mine, near Wickenburg, to take the place of the 10-stamp mill now in operation on the property, and a great deal of work is going on in the way of development. James Platt is the manager of this promising property.——Thomas Crook and partner are working a group of claims 12 miles south of Wickenburg, and have a considerable amount of low-grade gold ore on the dump holding for the resumption of work at the Humboldt smelter. They are down 128 ft. on one claim and on another 75 ft.——T. W. Wampler, representing a syndicate of Los Angeles men, has purchased the Peterson group of mines in the Weaver district. The property is immediately northeast of that belonging to the Octave Mining Co., at Octave, and comprises seven patented and six unpatented claims. The veins, which are extensions of those on the Octave group, are opened by a 712-ft. adit. It is practically certain that a 10-stamp mill will be in operation on the property within six months. W. L. Coffin, of Prescott, has been appointed superintendent.

Phoenix, October 24.

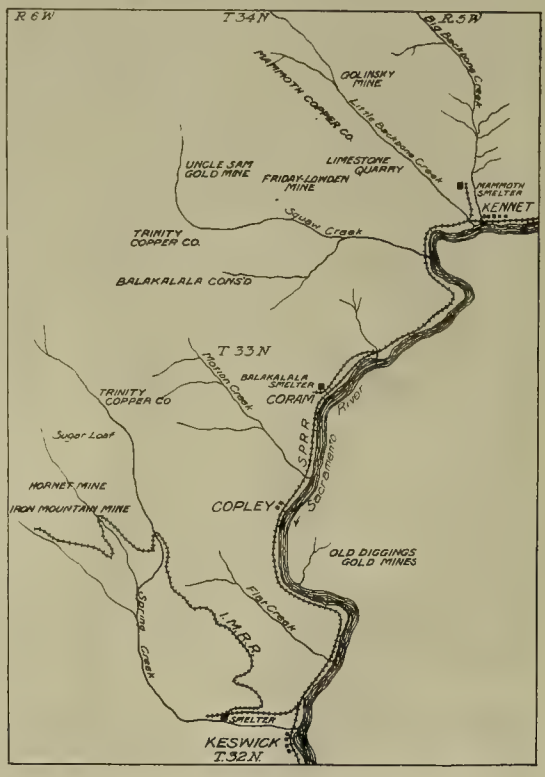
CALIFORNIA.

BUTTE COUNTY.

The Blue Channel Mining Co., composed of Los Angeles men, has purchased 240 acres of ground near Paradise, which includes the old Durgen drift mine, and has placed Edward D. Kesterline in charge of the work. The gold-bearing channel lies between a lava cap-rock and serpentine bedrock and is claimed to be 40 ft. thick, running $5 per yard.

NEVADA COUNTY.

(Special Correspondence).—The Grass Valley Dana Mining Co., composed of Tonopah capitalists, has taken a bond on the Christopher Columbus and Dana claims and started



Map of the Copper Region of Shasta County, California.

a force of men at work. A two-compartment shaft will be sunk and considerable machinery installed. The claims are between the Idaho-Maryland and Golden Gate mines.——The Tarr Mining Co. is repairing its storage reservoir and making other preparations for the working of the Blue Point placers during the coming winter.——Owing to the following of the late storm by sharp north winds and warm days the water problem is fast becoming as serious as earlier in the season. Many of the mines that resumed operations immediately following the storm are expecting to cease work in a few days unless conditions change.——A rich shoot of ore has been struck in the Lecompton. The mine is being worked under a bond by A. M. Gilbert, of Santa Barbara.——T. and J. Williams have leased the Benallack claims, between the Brunswick and Union Hill mines, and are arranging for considerable work.

Grass Valley, October 26.

SAN BERNARDINO COUNTY.

A syndicate of Goldfield mining men has purchased from William C. Lacy, H. C. Emert, and H. J. West a group of

three claims in the Old Woman mountains, about 40 miles southwest of Hart. The consideration is $15,000, a portion of which sum was paid down, and the remainder comes due on November 15. A force of six men has been started to work and a number of good stringers have been cut.——A vertical shaft has been started on the property of Millbank Johnson, known as the Sundown. It is said that a hoist and compressor will be purchased in the near future. The adit on the same claim is in 200 ft. and has exposed a body of low-grade ore averaging about $7 per ton.——The Hart Florence has found $168 ore in its shaft at a depth of 180 ft. A cross-cut has been started at the 180-ft. level and will be run 100 ft. before drifts to the east and west are started. A hoist will be put in and the shaft sunk to the 400-ft. level. J. C. Popper is manager.——The Flyer shaft is being deepened and the material taken out is being sent to the Little Giant mill. A depth of 50 ft. will be attained before cross-cutting or stoping is started.

SHASTA COUNTY.

F. H. Russell, of Redding, and his brother have found the rich gold channel known as the Tom White one-half mile south of Igo. The property was purchased last April after a number of years' dispute as to the ownership. It now appears that the Russels made this find some time ago, but have delayed announcing it until they could make all payments and so secure absolute possession. It is understood that several offers have been made, but that the owners are holding for $100,000.——The first furnace of the Balaklala smelter at Coram was finally blown in on October 21. The plant has a capacity of 1500 tons per day and is said to be the best equipped on the Coast. The Mammoth smelter has five furnaces, but their capacity is not so large as the three modern ones of the Balaklala. This is the fifth copper smelter to operate in Shasta county.——Paul Smith, of Kennett, has bought from Chris Baust an undivided half interest in the Golden Dream mining claim east of the Sacramento river above Kennett, adjoining the old Trask place. Joseph Bamber, of Coram, owns the remaining half interest.

SIERRA COUNTY.

The management of the White Bear mine has started a raise from the No. 1 adit to strike the gravel recently found in the drift above. This plan is necessitated because of the great amount of water which was found in sinking on the bedrock above.——The force at the Indian Hill mine has been increased and the work on the dam is being pushed. J. B. Elsea is superintendent.——Thomas Mason is doing the assessment work on the Golden Scepter gravel mine, near Bunker Hill.

TUOLUMNE COUNTY.

Operations have been started at the Draper mine, where a few men are at work under the superintendency of R. A. Nicholls.——Work was interrupted last week at the Confidence mine due to a shortage of water.——The shaft of the Anaconda, near Columbia, has reached a depth of 150 ft. and the water is coming in such quantities that pumps are to be installed. Two veins have recently been cut.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—It is expected that during the early part of the coming month the Lincoln adit will reach the Virginia City vein, cutting it at the 500-ft. level of the shaft workings. Driving has been started on the blind vein recently intersected and a 6-in. streak of ore is being followed that carries gold as high as $500 per ton. As far as the ground has been opened the streak has been found to be continuous. W. C. Hood is manager.——A new strike is reported from the Black Eagle mine on Chicago Mtn. In running the east drift from the sixth level, the orebody has widened to 7 ft., about 12 in. of which is high-grade carrying more than $50, while the rest is worth from $20 to $25 per ton. This property is operated by the Honest John M., M. & T. Co., J. F. Puchert serving as manager.——A large party of stockholders in the Golden Glory T. M. Co. spent the week in camp. All were from Ft. Worth, Texas, and while here arrangements were made whereby enlarged development will follow. A. A. Hayden, of Denver, is manager.——While work has been curtailed to a considerable extent at the American Sisters mine during the last six weeks, J. J. White, who is manager, is making ready for extensive development. Machine drills will be brought into use on the 160 and 275-ft. levels of the Headlight shaft workings. In the east drift of the 275-ft. level a streak of smelting ore is exposed that is 18 in. wide and from recent shipments returns as high as 600 oz. silver have been received.——The Miller adit, on Saxon Mtn., has reached another vein. On the foot-wall there is showing a streak of heavy lead ore that is 4 in. wide. Tests show $40 per ton in silver and lead.——The Allen property, in the gulch between Griffith and Alpine Mtn., is again undergoing development. J. Raymond, the owner, is driving the adit forward and is following an 8-in. streak of silver-lead ore worth $30 per ton. The heading is now nearing a cross vein and the objective should be reached in 15 ft. ——W. Farragher has taken a lease on a block of ground on the Hancock level of the Sunburst, on Democrat Mtn. Driving has been started and a streak of ore is being followed that is from 6 to 10 in. wide. The ore is worth from $80 to $90 per ton in silver and lead.——M. J. Riley, leasing on the Grant level of the same mine, is sending out occasional shipments of 220-oz. silver ore. No effort is being made for a heavy production, Mr. Riley being satisfied with operating expenses, pending an advance in the price of silver and lead.——Stephens Bros. & Old, operating the Mendota mill, sent out a carload of zinc last week. The shipment was consigned to the Canon City smelter and carried 60% zinc. The mill has a capacity of 60 tons per day and is being run on three 8-hour shifts. Dump matter is being treated exclusively.——Work is now in full swing on the Josephine mine, Kelso Mtn. Shipments will be started within the next two weeks. Frank Babcock, who is manager, expects to send forth a steady tonnage of medium and high-grade ore.——The Albro mine is producing a heavy tonnage of ore, the content varying from 2 to 3 oz. of gold. Work on this property has been carried on in a vigorous manner for the last year. The drift has been run for over 500 ft., and a streak of ore is showing that is from 10 to 16 in. wide. The workings are now reaching under the old shaft, from which ore of an unusually high grade was mined a number of years ago. Adolph Nelson is manager.——The Cumberland mine, at Alice, is again undergoing development. The water is being lifted from the shaft, preparatory to lengthening the drifts. A. V. Dickinson, of Alice, is manager.——A bonanza strike was made a few days ago on the second level of the Santiago mine. A body of ore has been found that is 5 ft. wide and the first shipment brought a settlement of $48 per ton in gold, silver, and copper. Stoping has been started and from this time forward regular shipments will be made. In the breast of the west drift a streak of heavy lead ore is exposed that is from 4 to 6 in. wide. Harper & Richards are operating under lease.——Shipments have been started from the Wilcox adit, the ore being taken from the ground on the Paymaster vein, being operated by the Waldorf Metals Company.

Georgetown, October 24.

LAKE COUNTY.

It is announced that all the iron-silver properties in the Leadville district will be operated as soon as the various plants are completely equipped with electricity. The work is being done by the Leadville L. & P. Co. and the power will come from the local plant at the mouth of the Yak adit. The hoist of the South Moyer is already equipped with electricity.——The Gypsy Mines Co. has been incorporated at Leadville to work the Gypsy property on Long and Derry hill. The incorporators are S. C. Collins, H. B. Collins, E. W. Collins, M. A. Hoyt, and James C. Crawford.——The annual meeting of the New Monarch Mining Co. was held in Leadville last week and the old board of directors was re-elected. A number of directors from Cleveland inspected the property and have decided

to sink the Cleveland shaft 100 ft. deeper and also to add other improvements. These same men are also interested in the Salida smelter and inspected that plant on the same trip.——The new owners of the Hilltop mine, in the Horseshoe district, are preparing to actively operate that property. J. C. F. Berger will be manager and associated with him is Edwin Pratt, of the Lanyon Zinc Co., of Denver. ——It is reported that the Clark interests in the Greenback mine have been sold to a party of Boston capitalists, and that this famous bonanza property will again be operated. It is understood that Patrick Mulrooney is instrumental in negotiating this transaction, and that he is anxious to resume work on the property. Under the reported arrangements of affairs the ores are to go to an independent smelter.

TELLER COUNTY.

The motion of the Portland Gold Mining Co. to amend its complaint, in the suit brought against Stratton's Independence, and lessees of that corporation, to recover heavy damages for ore alleged to have been wrongfully extracted from within the boundaries of the Portland estate, was denied by Judge Lewis in the United States District Court at Cripple Creek last week.——A flow of water amounting to probably 350 gal. per minute was struck in the Roosevelt deep drainage tunnel last week, at a distance of about 3900 ft. from the portal.——George Atherton and associates, who have purchased the lease of Morell & Bonbee on the Accident claim, adjoining the Pointer, at Cripple Creek, have made a strike at the bottom of a winze from the 285-ft. level of $85 gold ore. The claim is owned by A. McDougall of Brooklyn.——J. E. Kingsbury and associates, who are leasing on Colorado King, made a shipment last week. A new ore-house has been completed and the lessees are now in shape to make a regular production.—— The Jolly Tar mine, within the corporate limits of Victor, owned by the Strong Gold Mining Co., under lease to Abe Flacks and associates, of Victor, has resumed shipments. Operating between the 200 and 150-ft. points, a large body of milling-grade ore has been opened up and the initial shipment last week is estimated to be worth about $15 per ton.——The famous Victor mine, on the northeastern slope of Bull cliff, has been leased to the Western Investment Co., of Victor. Fred V. Bodfish, who was manager of the mine for several years, is confident that the Victor will in a comparatively short time be brought back to the shipping list.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The Hecla Mining Co., at Burke, has declared its regular monthly dividend, which is at the rate of 2c. per share and involves the distribution of $20,000. This is the sixty-fourth dividend paid by the Company, making a total distribution of $1,660,000, of which $140,000 has been paid this year.——The Snowstorm Mining Co., at Mullan, has paid its first dividend for the year. This is at the rate of 3c. per share and involves the distribution of $45,000. It is understood that arrangements have been completed by which the Company will receive a reduction of $1 per ton on its freight rate, and in view of the fact that shipments amount to between 400 and 500 tons per day, the monthly saving on this alone will be considerable. The Greenough Bros., who control the mine, also control the Panhandle smelter, and it is thought that a good deal of the ore from the mine will in the future be sent there for treatment.——William Sites, Thomas McGowen, Jesse Freeman, and others, of Wallace, are said to be promoting a scheme for a power line from the Slate Creek district of the St. Joe river to the Coeur d'Alene.——A letter to the stockholders of the Charles Dickens M. & M. Co. has been issued by W. H. Winfree, attorney for the common company. Some time ago suits to the extent of $90,000 were started against the Company, and there has been a considerable amount of dissatisfaction among the shareholders on this account. Mr. Winfree invites all those who are interested in the Company's affairs to call at his office and make an inspection of the books and to satisfy themselves as to the manner in which the indebtedness has been incurred.——Preparations are being made for a resumption of work at the Keating mine in the town of Wardner. David Goodsell, the owner of the property, has arrived in the district and has engaged a force of men to complete the assessment work on the unpatented claims of the company. The mine is tied up in litigation, but it is expected that a settlement will be reached in the near future.——A vein 40 ft. wide carrying 2 ft. of shipping copper ore and 38 ft. of concentrating ore has been opened up in the property of the Prudent group of claims on Toboggan gulch about five miles east of Murray. Shipments will commence as soon as the track of the Idaho Northern railroad has been completed.——James L. Ford & Co., of Spokane, acting on behalf of a number of New York capitalists, has taken an option on 55% of the capital stock of the Tarbox Mining Co., whose property is in the Saltese district. The option is for the period of 90 days and involves about $150,000. A force of men will be started at once on the property, and if the showing is up to present expectations, a concentrator will be built and regular shipments commenced. Large bodies of low-grade ore, with some shipping ore, have been opened up, and the property is regarded as one of the best concentrating propositions in the district.——A strike of about one foot of rich copper ore and some good milling ore has been made on the property of the Liberty company in the Lookout district. Comparatively little work has yet been done on this prospect, which is owned by J. H. Folsom, Ed. Werkheiser, and Ed. Godfred, of Wallace.——Quite a number of local mining men left the Coeur d'Alene at the end of the week to be present at the blowing in of the furnaces of the Panhandle smelter, the control of which was recently acquired by the Greenough Bros., of this district. The smelter is now in full operation and has about 5000 tons of ore on the dumps. A rate of $2 per ton has been secured for Coeur d'Alene ore, while the rate from Montana varies from $2.20 to $3.30. It is understood that enough contracts have been secured to keep the smelter at full blast from both Montana and Coeur d'Alene mines.——A strike of 6 ft. of good ore has been made on the property of the Josephine company on the Montana side of the Idaho-Montana divide. The property had been lying idle for years, but the management was recently taken over by Richard Daxon. The strike was made almost immediately after the resumption of work, but full particulars have not yet reached Wallace.——A contract for 300 ft. of driving has been let on the property of the Sheridan company. It is expected that this work will bring the drift under the orebody discovered in the upper workings.——The famous tailing suits of Josiah Hill, J. S. Hill, and others against the Standard Mining Co. have been settled out of court, after a litigation of several years. The suits were brought against the Standard company for the recovery of damages to agricultural land alleged to have been destroyed by dumping tailing into one of the branches of the Coeur d'Alene river.

Wallace, October 24.

MICHIGAN.

HOUGHTON COUNTY.

(Special Correspondence).—The Tamarack Mining Co. is experimenting upon a sub-shaft in its vertical shaft No. 3 in an endeavor to lessen the tremendous haul from the bottom of this opening. The sub-shaft will be sunk at a point 700 ft. north of the main shaft and will go down on an incline parallel to the lode. A hoist will be installed at the collar of this opening and the ore will be trammed from there to the main opening, where it will be hoisted to the surface. By this method it is hoped to save a haul of 400 ft. upon the main cables. This will mean a great saving, as it will be possible to supplant the present heavy duty ropes for lighter ones, which could handle the loads from the less depth as easily as did the others. The hoisting is at present from the seventeenth level. The shaft lacks 10 ft. of being one mile deep, and is the deepest vertical opening in the Lake Superior district.——Ahmeek

is now in ore at its new double shaft, which is 1500 ft. from the Mohawk No. 5 shaft. The Company does not own the outcrop at this point, and in order to develop its property in sections 28 and 29 they have started a six-compartment shaft. As depth is attained the compartments will diverge, forming two shafts of three compartments each. The shafts are now down 70 ft. and are sinking in the hanging wall. As soon as the lode is penetrated the shaft will enter the foot-wall and continue down in it. The shafts are being sunk at an angle of 10° and will strike the lode at a depth of 1250 ft.——No. 1 shaft of the Allouez Mining Co. is now below the twelfth level. The openings here present a much better ground than has been found previously in either No. 1 or No. 2 shaft. The Company is pushing work on the openings and leaving the opened territory, thus accumulating blocks of rich stoping ground that will keep the mine forces busy for some time. No. 2 shaft has reached the tenth level and the cutting of the station has commenced. It is expected that the shaft will reach the lode at a depth of 2200 ft., while No. 1 will strike it on the third level at a depth of 1200 ft. The mine is now shipping about 600 tons monthly, with a total extraction of 15 lb. per ton.——The Atlantic shaft is rapidly approaching the eighteenth level. Stoping is in progress in the twelfth level and driving is being pushed in the thirteenth. The lode opened in the fifteenth level is showing up extremely rich and proves the dip to be north at an angle of 65°.——Concrete foundations for two new steeple compound heads are being put in the Allouez-Centennial mill. The mill now has two simple compound and one steeple compound, which, with the addition of the two new heads and the steeple compounding of the two simple heads, will make a battery of five compounds with room for another whenever the production warrants it. The jigs in service in this mill are of the Woodbury type and are giving excellent satisfaction. The Company is having built in the Nordburg shops of Milwaukee a 600-hp. Corliss engine to drive the stamp-mill machinery. When installed this engine will be the largest of its kind in operation at any of the Lake Superior mills.

Houghton, October 24.

MISSOURI.

NEWTON COUNTY.

(Special Correspondence).—The past few weeks has noted a much increased activity in the Granby field. Perhaps the most important fact from this camp is the record-breaking turn-in made from the Goade mine. A carload of zinc-blende was sold by this company which assayed the highest of any ore in the Granby camp, running 64.1%. This company has a 100-ton mill and makes from one to two carloads per week. The property is upon the Little Boss Mining Co.'s ground, where two other mills are being built. The ore is found at 88 ft. and shows a face 20 ft. high and 22 ft. wide. The ground is hard and requires no timbering.——Five drill-rigs are actively at work upon the Trent & Granby lands, south of Granby. The first drill strike was made at 250 ft., cutting sheet ore. The later results have not been made public. A shaft has been started and a derrick erected.——A very old property is being re-opened in this camp by Williams & Hamby. Three shafts and three drill-holes are on the land, which was operated more than 20 years ago and abandoned on account of the low price of ore and the difficulty of getting the ore to market. One shaft is down 50 ft., a second down 126 ft., and the third 145 ft., all three showing large faces of rich ore. There is a dump pile on the lease which is exceedingly rich, running so high in ore that the Company will treat it upon the mill and expect to get 100 tons of zinc-blende. The new railroad, the Mo. & N. A., is within a mile of the lease.

Granby, October 17.

NEVADA.

DOUGLAS COUNTY.

The Flyer Gold & Copper Mining Co., which owns promising property near Buckskin, will put on a small force of men next week. The present shaft will be sunk deeper.——The Gates Co. is doing the location work on its large group of oil claims in Spring Gulch, near Buckskin. In doing this work they struck sandstone and shale with paraffin which, it is claimed, looked as good as the indications at a depth of 2000 ft. in the California oilfields.——The Union Blue Copper Co., whose mine is between Yerington and Buckskin, have started work and at a depth of 30 ft. struck calcite and gossan. Some sample pieces of ore taken out run 49.2% copper. They expect to sink to the 70-ft. level and cross-cut.

ESMERALDA COUNTY.

The Queen Consolidated Lease Co. is being formed to work a block, 400 by 600 ft., on the eastern part of the Hazel Queen claim of the Goldfield Con. The lease runs for 18 months and is one of the last to be granted by the Consolidated. John Donnellan & Co. is promoting the new company.——Under the superintendency of D. D. Muir, a station was cut this week at the 500-ft. point in the shaft of the Gibraltar lease on Combination No. 3. The first drift will be run to the eastward. During the last few feet the shaft cut several promising stringers.——The Gold Ridge Mining Co. has struck another nice body of free-milling ore on its property about two miles southeast of Lida, adjoining the Snow Storm property on the north. This property is owned in Gilman City, Missouri. The assays run 12 oz. silver and $86.40 in gold.——The mines of Goldfield produced during the week ending October 24 a total of 2036 tons, of an estimated value of $132,575. During the same period the Tonopah mines produced 5315 tons, estimated to be worth $134,450.

EUREKA COUNTY.

A 10-ton shipment of gold ore from the Windfall mine, near Eureka, has been sent to Salt Lake, to be tested by the cyanide process. The Western Mining & Development Co., of Goldfield, which recently obtained a bond and option on this property, has made a payment of $25,000 on the purchase price of $200,000.——A. P. Tenvoord and Joe Molena are putting the old Altoona mine in shape for active development. The old workings are being re-timbered and every preparation is being made to resume production.

HUMBOLDT COUNTY.

The Kindergarten mill at Vernon resumed operations Monday after a shut-down of about a month, caused by the breaking of the cam-shaft. The new shaft was delayed in transit in spite of the efforts of the company to get the fixtures on the ground as soon as possible.——George & English, who are leasing on the Badger claim of the Fine Gold property, at Mazuma, have ordered machinery for a mill. The equipment includes Huntington mill and a gasoline engine.——The Nevada-Illinois M. & L. Co. has been incorporated to do a general mining business in the Seven Troughs district. J. A. Jess and associates of Seven Troughs are the incorporators.——The Bellevue-Nevada Mining Co., of Bellevue, Ohio, has let a contract to B. E. Townsend, of Seven Troughs, to drive a 300-ft. adit on its May claim, which is an adjoining property of the Fine Gold estate.——The Merger lease on the Therien, on which a rich strike was reported a week ago, has been financed by Indiana men. With an ample treasury, sinking has been resumed with an increased force. The vein opened up on the 65-ft. level is unquestionably a continuation of the Reagan vein to the south.

NYE COUNTY.

The Diamond Queen Mining Co. expects to start a shaft at a point 200 ft. south of the lower adit on the Biddlecome & Culver lease. A hoisting plant is contemplated. E. J. Waugh, of Beatty, will have charge of operations.——The Belmont has cut a 38-ft. vein on the 1100-ft. level, from which assays of $19 per ton have been obtained.——The Mine Owners' Association caused the arrest of four 'high-graders' as they came off shift at the MacNamara mine early on Friday morning last week. The men were searched and several pounds of high-grade ore were found

on their persons and a number of sacks were also taken from the cabins of the guilty men. The offenders are held under bond pending the action of the district attorney, in whose hands the case has been put.

OREGON.

JACKSON COUNTY.

(Special Correspondence).—The Pacific Coal Co., of which R. E. Doan, of Los Angeles, is the largest stockholder, has 3000 acres of coal land five miles east of Medford, on which 4000 ft. of development work has been done. The longest drift goes in 1000 ft. on the vein, the latter being 10 to 12 ft. thick. Mr. Doan states that 75% of the coal thus opened is a marketable commodity. The better quality of it contains 55% fixed carbon, 6% ash, 3% water, and the rest volatile combustibles; the average of fixed carbon is said to be 40%. The Company has steel rails at Medford sufficient for five miles of railroad track and it is probable that a road will be built to the mine.——Champlin Bros. have been dredging four years on Foot's creek, near Gold Hill, and have worked out an area half a mile long 500 ft. wide and 35 ft. deep. The ground has yielded 30c. to $1.25 per cubic yard. Their new dredge is of modern design, operated by electric power.——The Brayden mine, near Gold Hill, operated by the Connor Water Co., has been active several years, and is opened by six levels from 300 to 1000 ft. long on the strike of the vein, which stands between schist walls. This Company bought the mine some time ago and has paid for it from the proceeds of operations. The 10-stamp mill, with plates and tables, is running.——Gold hill, which originally yielded phenomenally rich pockets of free gold, the most of which was extracted from 1858 to 1860, is still being worked over on a small scale by individual miners. The blackwell hills, on the south side of Rogue river, covering an area of 2 by 6 miles, yielded rich ore in pockets in the early days and are still of interest to the old time miner. The Millionaire mine, in these hills, has a hoist over a 400-ft. shaft. There is also a Nissen two-stamp mill, with plates and table, which will be run this winter. J. T. Davison is in charge.——The Shamrock, managed by W. P. Chisholm, of Gold Hill, has a vein of chalcopyrite ore in a schist country, opened by 1500 ft. of work. The ore will average 3 to 4% copper.——The Corporal G, on Sardine creek, has ore that yields $50 to $70 per ton at the Lucky Bart mill. W. A. Pierson, superintendent of the Black Eagle, is developing and erecting a small mill. The property belongs to Portland people.

Gold Hill, October 10.

MEXICO.

JALISCO.

(Special Correspondence).—The old Mataraña mine near Jolapa, in the Mascota district of Jalisco, has been purchased from the Mexican owner by the Mataraña Mining & Development Co., of Spokane, Washington. It is stated that the price named in the contract is ₱50,000, and that a portion of that amount has been paid. T. P. Harsh, manager for the Company, is now at the property. According to the mining history of this part of Mexico, the Mataraña mine produced several millions during Spanish colonial days. At the opening of the struggle for Mexican independence it was the scene of a massacre of the Spaniards connected with it. For many years the mine remained idle and the walls of many of the old workings caved in.——M. P. Wright, of Los Angeles, California, representing Los Angeles and Tucson interests, has closed a deal for the Certuchena mines near Ahuacatlan, in the territory of Tepic. The mines have been extensively developed and are equipped with a small mill. It is the intention of the new owners to at once erect a modern reduction plant, consisting of stamps, concentrators, and cyanide annex. The plans include the installation of a hydro-electric plant at a point five miles from the mines, and the transmission of power for mining and milling operations. The mines are but a few miles from the line of the Southern Pacific extension.——The San Pedro Analco Mining Co., a Spanish concern of Guadalajara, has decided to install a cyanide plant at the San Pedro Analco silver mines in the Hostotipaquillo district and treat the ores by direct cyanidation. The Company is now treating its ores by the old patio process of amalgamation.

Guadalajara, October 20.

SONORA.

(Special Correspondence).—The Quintera mine, in the Alamos district, Sonora, owned by the Bank of Paris, France, is producing an average of 60 tons of ore per day. The metal contents are silver-lead in the upper zones and silver-copper below the 500-ft. level. The mine is operated to a depth of 1600 ft., being the deepest in Sonora. Ninety per cent of the ore is sent to the stamp-mill for concentration, and the remaining 10%, with the concentrate, is reduced in the company's smelter. Good results and clean work are attained.——The Santo Domingo joins the Quintera on the north. The greatest depth attained is 500 ft. on the vein, which at this level is opened for a length of 700 ft., and cross-cuts prove the vein to average 40 ft. wide in the deepest levels attained. The ore to the 250-ft. level is silver-lead. Below that level it changes to silver-copper. The lead occurs as a sulphide and the copper as a glance and chalcopyrite. The mine is owned by the Sonora Central Mines Co., of Chicago. This Company has about completed two years of active development of the vein below the antigua workings and will soon begin building a modern ore-dressing plant. The product of one foot width of ore on the foot-wall of the vein assays 270 oz. silver per ton, the ore being a silver-copper glance. Seven feet of mixed silver glance and chlorides in the centre of the vein yields 70 oz. silver per ton.——The Pulpito mine, belonging to Sr. Gooycoolea, of Alamos, joins the Santo Domingo on the west. A cross-cut adit, 10 by 10 ft. in section and 800 ft. long, cross-cuts a vein 100 ft. wide, the ore being of a mixed smelting and concentrating character.——The Zambona mine joins the Santo Domingo on the north. R. R. Coleman, of Los Angeles, is president of the company. This mine has large reserves of silver-lead and silver-copper ore blocked out to a depth of 700 ft.; also a large tonnage of tailing impounded from former mill work. Building of a modern ore-dressing plant is being considered by this company. All these mines have been operated for 150 to 175 years. Their combined production of silver under the antigua operations was probably 120,000,000 oz.

Alamos, October 22.

Part of Northwestern Mexico.

Special Correspondence.

LONDON.

Lancefield Gold Mining Co. of West Australia.—Troubles of Dunderland Iron Ore Co. — Report of El Oro Mining & Railway Company.

The additional capital of £26,000 raised in April last by the re-construction of the Lancefield Gold Mining Co., operating in West Australia, has proved to be insufficient for the purpose of putting the mine and plant into order, and the shareholders have accepted a plan of raising a further £50,000 by means of preference shares. This mine was floated in London three years ago by Bewick, Moreing & Co., and it appeared to be a very promising low-grade proposition. At first a stamp-mill and cyanide plant performed exceedingly well. Unfortunately the nature of the ore changed considerably as development proceeded, becoming much harder, and the sulphides proving more refractory. It was found necessary to alter the plant to dry crushing, roasting, and cyaniding, and subsequently the plant had to be increased to make up for the greater time occupied in treating the ore. It was thought that an additional £26,000 would be sufficient. This expectation has not been fulfilled. There are several reasons for success not having as yet been attained. The refractoriness of the ore is one, and another is the large amount of moisture in the ore, which necessitates great expense in drying. Also the mine is not sufficiently developed ahead of the mill. At the meeting of the shareholders held this week to consider the state of the Company's affairs the directors and the managers were necessarily in an apologetic mood, and some hot shots of criticism were fired at them. A resolution was moved to the effect that Bewick, Moreing & Co. should retire from the management and let somebody else have a chance, and J. H. Curle spoke of the present miserable condition of the Company being due to the want of development of the mine. Eventually the shareholders decided to persevere on the present lines, and accepted Mr. Moreing's proposition for raising further funds. The present capital in ordinary shares is £260,000 in £1 shares. Mr. Moreing's proposal was to create 100,000 new shares of 10s. each, entitling the holders to a return of 100% out of the first available profits, and thereafter to a preferential dividend of 20%, together with a pro rata distribution with the ordinary shares. Of these shares 66,666 are to be issued now, and a call given on the remainder at par.

A few weeks ago I referred to the serious position of the Dunderland Iron Ore Co. that owns the concentrating deposit in Norway. At that time the directors were asking shareholders to subscribe for £100,000 pre-preference shares, in order to provide funds for modifying the machinery with a view to minimising the dust troubles. It is not to be wondered at that the response to this issue has been small. Only about £23,000 has been applied for. It was therefore necessary to place the matter in the hands of the debenture holders, and Mr. Peat and Mr. Dexter, accountants, were made receivers. There are certain further financial complications still to arrange for, in the shape of loans that were issued on the security of prior lien debentures. The Consolidated Gold Fields of South Africa, Ltd., are large share and debenture holders, and they are also creditors for loans ranking with the prior lien debentures. The trustees and ex-directors are now discussing other schemes for re-arranging the capital and providing further funds. It is remarkable how unlucky the Consolidated Gold Fields of South Africa are when investing their money in mining enterprises outside of South Africa. No statement has ever been made as to the reserves of iron ore at the Company's property. There are not wanting doubting Thomases who question the extent of the orebodies and who think that this will be a stumbling block in addition to the other drawbacks of high cost, difficulties of briquetting, and the trouble with dust. Before additional money is spent further investigation of the ore-reserves should be made.

The report of the El Oro Mining & Railway Co. for the year ended June 30 last shows a profit of £205,209, out of which £24,090 has been provided for expenditure on capital account, and £167,062 distributed as dividends. The issued capital of the Company has been increased during the year by £67,500 in shares, paid for the adjoining Somera company under the circumstances detailed by me in the MINING AND SCIENTIFIC PRESS six months ago, and now stands at £1,147,500. The total sum distributed in dividends to date has been £1,009,062. During the year in question the 200 stamps crushed 267,387 dry tons, which by cyaniding yielded bullion to the value of $2,253,086, or $8.43 per ton, the average extraction being 89.4%. The reserves of ore on June 30 last were 433,964 tons averaging $8.53 of gold and 4 oz. silver. The cost of treatment totaled $1,376,222, or at the rate of $5.14 per ton. This figure is rather higher than previously, owing to the greater amount of development done.

JOHANNESBURG, TRANSVAAL.

Big Consolidation. — Machine Stoping. — Tin Enterprises. — East Rand Shaft Sinking.—Profit Aggregates.

The consolidation of the Village Deep and the Turf mines has been accomplished, all serious opposition having been withdrawn owing to force of circumstances and aided by the special report of Mr. Curtis. Though Rand amalgamations may in time be carried to excess, the consolidation of these two adjoining mines, one producing, but saddled with a heavy debt, the other only shaft sinking, but well in funds, has been prompted by the soundest business policy. The capacity of the Village Deep mill is being rapidly increased to 41,000 tons monthly. The Turf mines' seven-compartment shaft will be down to the reef early next year and the two inclines of the Village Deep are being sunk to the level of the assumed strike.

At a meeting of the Chemical & Metallurgical Society the other day, Tom Johnson, a thoroughly practical mining man who recently advanced daring ideas for 'improvement' in our underground work, replied to his critics. A wide range of subjects has been covered in the discussion, a contention of foremost importance appearing to be that shafts are not worked to proper advantage, and that the standard of assumed shaft requirements is usually excessive. A suggestion was put forward by Mr. Johnson that we should set many more machine-drills to each stope-face than practice now sanctions, and thus work out the blocks more quickly, leading to a fewer number of working faces for a given tonnage. A critic urged that the employment of two or three contractors of varying capabilities in one stope would soon bring the face into hopeless shape. To this argument Mr. Johnson replied that he would shift his contractors (as a contractor in hand-stoping does his boys) so as to give the good men the difficult places and the poor men the easy. It is not certain how the good men would fall in with such an arrangement, nor how a contract could be regulated to suit them, if called upon to frequently leave work-places broken to their fancy, and to take up what they might consider a disordered place elsewhere. After all, the capable miner does look ahead, with beneficial results to himself and to the company, if his contract is favorable. Mr. Johnson, in his plea for the greater crowding of stopes with machines, turned for a parallel to surface works development, and cited the great scale of operations adopted, the heavy stamps and large mills erected to treat the ore at the utmost speed. It seems that this parallel may lead to a pretty fallacy, for the stope (in length and in width) is more or less a constant, to which the number of drills must be regulated. Obviously, a stamp does as much work in a 100 as in a 400-head mill. In average Rand stopes more machines than three to 200 or 250 ft. of backs would undoubtedly cause unsatisfactory congestion, and although Mr. Johnson's scheme of more rapid exhaustion of mine sections is good in principle, its practical adoption presents some serious objections.

Tin continues to be the most popular and promising of

the base metals sought after by the prospecting syndicate in various parts of South Africa. Though a higher degree of concentration in certain places might be advantageous economically, its wide distribution is otherwise a satisfactory feature. During the past week, a new Swaziland alluvial tin company has been formed under the aegis of influential men. This venture is capitalized at $125,000, and the development of certain of Wright's concessions will be undertaken, where alluvial deposits have already been proved in the region of the Swazi tin mines and of the McCreedy properties. An effort is now also being made to float a tin enterprise in the Koeberg district, 10 miles from Cape Town, where lodes which furnish rich samples have been prospected. The reporting engineer suggests the erection of a 10-stamp battery. This concern, called the Tygerberg Tin Mining Co., is capitalized at £80,000 in £1 shares, of which 42,000 are offered to the public. In the usual way, prospective profits are flaunted in the advertisements with pseudo-science, with a presentation of reports of rich assays seductive to the man in the street, and quite meaningless to anyone endeavoring to arrive at the actual facts. Every clerk or bartender in the country knows that an unpayable tin lode may give, upon occasion, a 70% assay. It is much to be hoped that the Tygerberg promoters hold a safe property, for the Cape has had a sorrowful experience in the collapse of the Kuils river tin mines, near the Capital, and another failure would constitute a serious blow to local mining enterprise.

Still another tin proposition has been brought prominently forward by the report upon the Transvaal Bishoff, Ltd. (in the Waterberg district, north of Pretoria), by Dr. Jorissen and Mr. Hoffman. On this property the mineral occurs both in a lode and in alluvium. It is stated that crushed zones are found between the red granite and the overlying felsite and granophyre, in which pegmatite dikes leading to tin bearing veins are abundant. Much of this ground is said to be so rich it could be economically sacked and shipped without previous concentration. The most important deposit, however, appears to be the alluvium, of which over 3,000,000 cu. yd. are declared to contain tin to the value of $1 per yard. Hydraulicking is recommended. The water-requirements are estimated at 1000 gal. per yard. This will have to be pumped to an elevated reservoir, for this part of the Transvaal is unfotunately not blessed with facilities for gravity water service as is Swaziland. The costs of working on a basis of 650 cu. yd. per day are estimated as follows:

Pumping, at 3d. per 1000 gal	£205
Supervision and labor	475
Tools, bags, and stores	38
Smelting charges in Europe, at £8 per ton.	280
Rail freight, at 34s. per ton	59 10s.
Transport to railway	17 10s.
Total	£1075

Allowing £25 for contingencies, this works out at 1s. 4.3d. per cubic yard, a high figure compared with the records of more favored fields, but one which will allow a good profit if the valuations arrived at are reliable. The outside world, which has had a laugh at the Transvaal over the noisy and deplorable fiasco of the Bushwold, is inclined to receive with a grain of salt all reports concerning tin deposits in South Africa; but it must be understood that the costly lessons of the past have not been wasted, and that a payable industry is being surely established.

Though tin is undoubtedly receiving most attention, silver-lead is also enjoying some favor. It is reported that the Transvaal silver mines, closed down (so far as company work is concerned) some 15 years ago, are shortly to be resuscitated by men with large financial resources. The deposits contain copper, silver, and lead in the form, principally, of galena and tetrahedrite, and occur in the Pretoria series of shales and quartzites not many miles from the Capital.

Another move has been made in the 'far east' Rand toward the wider activity already predicted. This is seen in the renewal of shaft-sinking operations by the Cloverfield Mines, Ltd. In 1906 work in the shaft was suspended, as at many other points along the Rand at this time of depression. A depth of 1345 ft. was reached before closing. The reef has been tapped on this property at depths of 1964 and 2997 ft. by the diamond drill.

The monthly profits of the Rand now exceed £1,000,000. Their rapid growth is shown by the declarations for certain recent periods:

	Tons milled.	Profit.
August 1905	874,165	£567,306
August 1906	1,205,986	724,573
August 1907	1,317,799	875,025
July 1908	1,823,691	1,003,236

From these figures it will be noted that in spite of the enormously increased tonnage, occasioned largely by milling more low-grade ore, the profit per ton milled has only fallen in four years an average of one cent per month.

GUADALAJARA, MEXICO.

Los Reyes Mines.—Marcus Daly Estate Investing in Hostotipaquillo.—Railroad Connection to Manzanillo. —Mines Sold in Ayutla.

Negotiations between representatives of the Marcus Daly Estate, of Butte, Mont., and New York, and the Los Reyes Mining Co., of Guadalajara, for the transfer of the Los Reyes mines, in the San Sebastian district of Jalisco, have

State of Jalisco, Mexico.

been dropped. What is generally regarded as a generous offer by the Daly estate was refused by the local Mexican company, and there is little prospect of the negotiations being renewed. The proposition of the Daly interests provided for a year's development work, in which time they were to spend not less than ₱100,000, and open unexplored portions of the Los Reyes properties. At the end of the year, in the event the mines developed satisfactorily, the purchase was to be made for ₱1,000,000. The Daly people are now devoting attention to the Hostotipaquillo district of Jalisco, and it is probable that they will invest there. Henry E. Crawford, of New York, is the principal representative here. The Manzanillo extension of the Mexican Central Railway, from Tuxpan to the Pacific port of Manzanillo, a distance of 100 miles, is rapidly nearing completion, and will be opened to traffic in November. This line will provide the first connection from central Mexico to the Pacific Coast. The completed line will represent a cost of ₱20,000,000, or an average of ₱200,000 per mile. Some of the heaviest railroad construction in Mexico was done between Tuxpan and Colima, where the line crosses the *bar-*

rancas of the Sierra Madre. An option on the Tajo de Dolores mine, in the Peregrina camp of Guanajuato, held by M. Murdock Wiley, of New York, has been taken over by the Proprietary Mines Co. of America, and it is said that the property will be purchased for ₱1,100,000. The mine is owned by W. H. McCord and L. M. Fairbanks, the latter a brother of Vice-President Fairbanks. Some shipments of high-grade ore are now being made. Foundations for a 60-stamp mill have been completed, and it is planned to erect reduction machinery within the next few months. December 10 has been set as the date for the completion of the Southern Pacific extension from Orendain, the Mexican Central, 25 miles from Guadalajara, to Tequila, the centre of the tequila industry of Jalisco, a distance of 34 kilometres. As soon as this link is completed trains will be operated between Orendain and Tequila, connecting with the Guadalajara-Ameca trains of the Mexican Central. According to present plans, the extension will be completed to Tequesquite by next March. This will place transportation facilities within easy reach of the mines of the Hostotipaquillo district. F. E. King and Harry T. Curran, of Guadalajara, have sold the Last Change and San Francisco copper mines, in the Ayutla district of Jalisco, to A. J. McQuarters and associates, of Mitchell, South Dakota. The consideration was ₱60,000. The purchasers will organize a company with a capital of $250,000 to develop the properties. Pending the erection of a modern reduction plant, ore from the Tenamache mine, in the Territory of Tepic, is being treated by the patio process. It is expected to start bullion shipments within a few weeks. The mine, an '*antigua*,' is developing in a satisfactory manner. It is owned by the Tenamache Mining Co., of Guadalajara, of which W. R. Ramsdell is the head.

The Amparo Mining Co. has entered into a contract with C. E. Wood, a Guadalajara nurseryman, for the raising of 500,000 eucalyptus trees on the Company's Embocada ranch in the Etzatlan district of Jalisco. The trees will be raised from seed. It is expected to have 150,000 trees growing within the next year. By the establishment of the eucalyptus forest the Amparo company plans to provide an abundant supply of mine timbers for its properties. Some of the trees will be ready for cutting at the end of five years. Jesse Scobey, general manager for the Virginia & Mexico Mine & Smelter Co., also has made arrangements with Mr. Wood for eucalyptus planting, the trees to be raised on ground adjoining the Company's properties in the Hostotipaquillo district. Mr. Scobey's company may decide to follow the example of the Amparo people and establish an extensive forest. The Mexican Central railway is now having eucalyptus trees planted at various points on the system, and in this way expects to provide ties and telegraph poles for the future.

MEXICO.

Mining Law Revision.—Progress in Tepic.—Kansas Cananea Copper Co. Organized.—News from Zacatecas and Nueve Leon.—Planting Eucalypti for Mine Timbers.

The much-discussed Article 144, of the proposed new mining law, forbidding new foreign companies from acquiring title to mines in Mexico, has been disposed of. At a meeting of the Cabinet on October 10 it was decided to eliminate the aforesaid article from the proposed revision of law before its presentation to Congress. The action of the Cabinet was not made public until the 14th, when Minister of Fomento, Sr. Olegario Molina, author of the measure, advised the Mexico Chamber of Mines of the Cabinet action. The draft of the new law was made public just at a time when the financial conditions of the world were such that capital was not investing anywhere, so that the opponents of the measure took full advantage of this circumstance, and every deal that was checked for lack of capital was said to have been stopped by fear of Article 144. By this means great pressure was brought to bear upon the Cabinet, which at first favored the restraining article, but finally yielded to what seemed to be public opinion and determined not to present the objectionable article to Congress. The native press seems to be both for and against the action of the Cabinet, but some are most bitter in their denunciation of the backsliding tactics of the administration. In fact it appears that more criticism has been hurled at the President during the last few months than has ever before been dared. In addition to the withdrawal of Article 144, the responsibility of mining companies for accidents not due to its own negligence is also removed, and Congress has voted to keep machinery on the free list.

In several parts of the territory of Tepic considerable activity is manifest. The Cambio Gold Mining Co., of Cincinnati, has completed at its Frontal mine in the Rosa Morada district, a 35-ton concentrator and is expected to complete a cyanide plant before the end of the year.

In Sonora, the Kansas Cananea Copper Co., with a capital of $10,000,000, has been organized by Bisbee and Chicago capital for the merging of the Ortega (or Southwestern), the Red Cloud Copper Co. (or the Consolidated Gold & Copper Co), and the Miller. El Tigre is said to have been taken by New York capital for $8,000,000.

In Zacatecas several rich gold finds are reported from the San Carlos mines in Mezquital de Oro. The Mazapil Copper Co. is putting in its third tram on the Roe system, and the one connecting the mine with the mill at Concepcion del Oro, a distance of 7 kilometres (or $4^1/_8$ miles), whereby, at the rate of 23 tons per hour, the ore is being transferred at 1c. per ton. Work has been started on a 100-ton cyanide mill for the Cinco Estrellas Mining Co., Pinas, Zacatecas, and is to be completed by the end of the year.

Reports from Nuevo Leon are to the effect that the Empire Zinc Co. has bought the Peñascosa mine and dump near Fierro station, Coahuila, and that the Pablo de los Santos has bought for ₱174,000 control (or 620 of the 1200 shares) in the Cruz del Aire mine, at Sabinas Hidalgo. The latter mine was little more than a prospect only a couple of years ago, but by careful development it has opened into a notable lead and zinc producer.

JUNEAU, ALASKA.

Activity in Rainy Hollow District. — Road Building. — Bornite Deposits.—Silver Bow and Yankee Basin Developments. — Hadley Smelter.—Resuming Operation.

Reports from the Rainy Hollow district, British Columbia, which is tributary to Haines, Alaska, indicate that this will be among the richest and most productive in the region. The erection of mine buildings, boarding and lodging houses, and the installation of an air-compressor are planned for this winter, it being the intention to work during the entire year. A mill-site and a 30-acre townsite have been taken up not far from the mines, and it is intended to erect a smelter to treat the ore from the entire district. Copper and gold will probably be the chief products. However, at a distance of 12 miles from Rainy Hollow, Capt. Brown has located a square mile of coal land, and on Chilcat river he has located what appears to be a large body of magnetic iron ore. A wharf and warehouse will be built at Haines to handle the freight billed through to British Columbia, thus avoiding payment of American duties.

The property of Tim Creedon is another of the good prospects in Rainy Hollow. It is on the Custer Lead, a strong silver-lead vein which is said to be traceable for four miles across country. The work done on this claim consists of 100 ft. of driving and 20 ft. of cross-cutting. There are a number of other promising properties in the district, most of them being valuable for copper, the copper being present in the form of bornite. There has been no difficulty in interesting capital; all the claims that have been surveyed have been bonded, and the owners of the remaining claims expect to be successful in procuring funds for further development.

The Porcupine district, Alaska, has been opened up as a placer country. The Porcupine Mining Co. has completed

a large flume and is now in condition to begin earnest work on its property. Results obtained so far have been encouraging and some rich gravel has been taken out. It is reported that $6000 was washed out by four men in two days from some of the best ground. The McKinley Mining Co. has also built a flume and has started work. The Alaska Road Commission has done a great deal toward making the development of these two districts possible. Although the road is not yet ready for teaming it enables the 'musher' to go through dry shod, which is a great improvement. The Canadian Government has taken up the work at the international boundary and is building the road through to Rainy Hollow. Thirty thousand dollars has been appropriated, which it is estimated will cover the cost.

The shortage of water and the fall of snow will soon compel the mines in Silver Bow basin to close down for the winter. The Perseverence Co. contemplates treating the concentrate on the ground by fine grinding and amalgamation instead of shipping to smelter, as heretofore. It is likely that grinding pans will be used. Litttle profit is made on the concentrate after costs of smelter treatment and transportation are paid. The residue from amalgamation will go to waste. The suit in the Circuit Court of Appeals concerning certain water rights on Gold creek has been decided in favor of the Perseverence Co. A party of men with a large outfit has gone to Yankee basin to develop the Whipple mining claims. These adjoin the north end of the Eagle River property and are said to be exceedingly promising. The orebody has been found in the lower adit of the DeGroff mine on Chichagoff island and the ore is said to be of the same grade as that in the upper workings. The Hadley smelter will be blown in again soon. It will start on Mamie and Stevenstown ores, of which an abundance is on hand.

PONDERAY, IDAHO.

Ponderay Smelter Blown in.— Organized Opposition to American Smelting & Refining Co. — Notable Gathering of Mine Owners.

The Panhandle smelter, at Ponderay, two miles from Sandpoint, Idaho, formerly owned by the Panhandle Smelting Co., and now owned by the re-organized Idaho Smelting & Refining Co., was blown in October 23 in the presence of 300 visitors from Spokane and Helena. The visitors were attracted by the fact that the existence of the smelter means life for many small mines in Montana and the Northwest. This smelter has had a checkered career since its erection six years ago. It was operated a year ago for a short time, but has never been a business success. It needed extensive enlarging and alteration to make it practicable. This has all been accomplished by the present management.

The original furnace of 125 tons capacity has been duplicated, and three roasting furnaces have been installed. One furnace and two of the roasters are yet unfinished, but the work is being rushed in order to bring the plant up to its full capacity as soon as possible. About $50,000 has been expended in the improvements, and double that amount in the purchase of ores, and the plant now has on hand enough to keep it in operation for several weeks.

Ores, however, are arriving daily from the Couer d'Alene and Montana, and numerous small properties in Washington and around lake Pend d'Oreille are ready to contribute small amounts. The success of the smelter depends upon its ability to demonstrate that ores can be shipped from these widely separated districts in opposition to the American Smelting & Refining Co. It is being operated solely for this purpose. This attempt is due to the fact that producers of ore have for a long time felt the futility of dealing with the 'trust' on its own terms, and a movement was started over a year ago in Montana to organize the mine owners for the purpose of building their own smelter. The Montana Mine Owners' Association was formed, and quickly drew into its ranks most of the independent producers, now estimated at nearly 1000 members. The Panhandle plant being idle, and suitably situated at the junction of three railways, and in need of capital, the arrangement was made, by which the smelter was given over to the mine owners under a lease with an option to buy. The Greenough Bros., owners of the Snowstorm mine, being members of the association, took large blocks of the Idaho Smelting & Refining stock, with the understanding that they would receive all the independent ore from Montana necessary to keep the plant running. Under this agreement they took over the management of the smelter. They also bought large blocks of the old Panhandle stock, and at present own a controlling interest. The work of remodelling was begun last spring, and is now almost completed. It is planned to add new furnaces as fast as the ore supply increases and to prepare for the smelting of copper as well as of silver-lead ores. The plant is at present equipped only for the latter. Special

The Coeur d'Alene, Idaho.

trains were run from Helena and from Spokane and several mining men of note were among the visitors, on the occasion of blowing in the furnace. It is expected to develop the plant to a capacity of 1000 tons per diem. At present it is capable of treating 250 tons.

BUTTE, MONTANA.

Enlarging Belmont Shaft.—Corra Shaft Dismantled. — Tramway and Minnie Healy.—New North Butte Orebodies. — New Steele Process Plant Proposed.

The Anaconda Copper Mining Co. is enlarging and equipping the Belmont with the object of making it the principal working shaft of the Company for the Anaconda, Never Sweat, and St. Lawrence mines. It was surmised that this was the purpose of the Company when it took over the Belmont in the settlement of the litigation between the Amalgamated and the Heinze companies by which the Butte Coalition Co. succeeded the Heinze interest. Although the Belmont is situated more than a mile south of the Anaconda, St. Lawrence, and Never Sweat mines, the deep workings of the latter are under the Belmont, and even farther south. The economy of using the Belmont for mining the south vein of the Anaconda Co. is apparent.

The expense of the haul underground to and from the present shafts, and then the haul of the ore from the surface to the main line of the railroads in the southern part of the district, makes a large item. The Anaconda shaft is also fully 600 ft. above the Belmont. The latter shaft, 1000 ft. deep, is being enlarged to a full three-compartment shaft all the way down. At the 1000-ft. level it is connected with the 1600-ft. level of the Anaconda mine. The Corra surface plant is being completely dismantled. The air-compressor has been moved to the Rarus mine, and other machinery and equipment is being distributed to various mines of the Coalition and Anaconda companies.

The big Tramway shaft being sunk by the Butte Coalition and Butte & Boston jointly on property owned by both, will not be put in commission for actual mining before the first of the coming year, and in the meantime sinking will be continued, and levels opened into the Minnie Healy under the fire-zone. The Tramway is now considerably below the 1600-ft. level, where sinking was temporarily suspended while a big station was being cut at the 1600-ft. point. When the station is finished a level will be run into the Minnie Healy and sinking on the shaft will be resumed and kept up until a depth of at least 2000 ft. has been attained. In the course of development work from 200 to 300 tons of ore are taken out daily, in addition to about 700 tons from the Rarus mine. With the opening of the new levels a new mine is practically made out of the Minnie Healy. The fire has been walled off completely and the efforts directed toward keeping it confined to the old workings. In the Rarus, mining is being done on the 1400, 1500, 1600, and 1700-ft. levels, and a new level is being opened at 2000 feet.

The North Butte Co. is doing some driving on the Berlin vein at a depth of 1600 ft. The vein contains a good quality of ore, but of a low grade. Cross-cuts from the Edith May are also being extended from the 1000 and 1200-ft. levels and will soon reach the Berlin vein. The result of these developments will determine the situation for the new shaft to be sunk by the North Butte on the Berlin claim. The North Butte, while mining 1400 tons of ore per day, is engaged in opening the mines on the new levels at a depth of 2000 and 2200 ft. The Edith May vein, because of its southerly dip, is close to the Speculator shaft at those levels. At 2000 ft. the south branch of the vein was cut within a distance of 100 ft. from the shaft. The vein divides some distance west of the shaft and branches eastward. On the upper levels no ore was found in the south branch, but some good ore has been discovered at 2000 ft. From the 2200-ft. level a drift has been started westward on the south branch. A short distance from the station an orebody was opened up, containing considerable copper glance. As this is east of the point where the two branches are believed to unite, it is hoped that the vein and orebody at the point of juncture will be found unusually large and rich. Since the North Butte resumed operations Manager Carson has kept the cost below 8c. per lb., including all costs of mining, smelting, and marketing. The cost has been as low as 7.1c. per lb. for one month. The North Butte has an immense quantity of first-class ore blocked out, but the average of the ore shipped is about 4½% copper. The company makes good profit with 4½% ore at present prices of copper.

The inventors and makers of the mill known as the Steele process claim that their system has not been given a fair trial by the La France Copper Co. at the Lexington mine, and they want an opportunity to establish a plant for the Butte & Superior Co. at the Blackrock mine. Negotiations are now progressing. On a lot of shipments of Lexington ore at Dallas, Texas, where the Steele people have a large mill, the results were satisfactory, and the separation of the copper, silver, gold, lead, and zinc was quite perfect, but as soon as it was attempted to run a mill at the mine, results were different. The plant at the Lexington was identical with that at Dallas, but it did not do the same work. Some changes were made without improving results, and when the municipality of Walkerville brought injunction proceedings against the La France Co. to stop the dust nuisance, the plant was shut down.

SALT LAKE, UTAH.

Fink Process at Garfield. — Bullion Beck & Champion Acquired by United States Smelting, Refining & Mining Co. — Utilizing Zinc Middling.

The demonstration at Garfield of the commercial possibilities of the Fink process for smelting is being watched with keen interest by local mine operators and metallurgists. Assurance has been given that the plant will be ready in about a month; it is being erected on the property of the Boston Consolidated Mining Co., under the personal direction of the inventor, Edward Fink, and the preliminary cost is borne by Samuel Newhouse personally. Mr. Newhouse first heard of the Fink process early in the present year, and sent his engineers to investigate; they reported that it was not without merit, and recommended the expenditure of money in conducting experiments. Accordingly, Mr. Fink was instructed to proceed with the construction of a furnace capable of treating 300 tons of ore per day. This was done, and the equipment is on the ground, ready for installation. I have obtained the following description from an authorized source: The furnace now being installed at Garfield consists of two sheet-iron cylinders, lined with refractory material, set with their ends against a central fire-box, somewhat similar to the hot-blast stove. In this instance the fire-box will be arranged to burn fuel oil, being in the nature of an oven for the heating of the blast. The charged ore is placed in one of the cylinders, which is slowly revolved while in use, and the blast, together with the flame from the oil burners, is turned into the opening in the end of the cylinder over and in contact with the ore, when the gases of combustion are deflected back through the hot-blast stove to the opposite cylinder, where they are discharged from a stack. The intention is that while the charge in the cylinder to which the blast is directly delivered is being reduced, the heat of the waste gases will desulphurize the charge in the opposite cylinder. The operation is then reversed and the charge in the second cylinder is reduced, while a fresh charge in the first cylinder is being desulphurized. The direction of the gases, in the meantime having been reversed, the operation of smelting is made practically continuous. The simplicity of the process and the economy with which it can be operated are among the strong points claimed by Mr. Fink, together with the low cost of installation and maintenance.

The transfer of a controlling interest in the Bullion Beck & Champion mine, in the Tintic mining district, last week, to the United States Smelting, Refining & Mining Co., has recalled some ancient history. The property was discovered about 1876 by John Beck, a devout Mormon and a four-ply polygamist, by whom it was operated with considerable success for a number of years. In the latter part of the eighties and the beginning of the nineties it was numbered among the principal silver-lead producers of Utah. Next after the adjoining Centennial Eureka mine (one of the chief assets of the United States company now), it headed the list. John Beck received dividends on his own stock to the amount of more than $1,000,000, and the mine has a record of a total profit distribution of $2,738,400. Beck lost his holdings in the mine about 18 years ago, and was reduced to a state of pauperism after having arrived at a ripe old age. In late years the property has been operated mostly by lessees. It still contains some extensive orebodies, mostly low grade, which the new owner will doubtless use to advantage at the smelter at Bingham Junction.

The addition to the zinc concentrator owned by the Grasselli Chemical Co., at Park City, has been completed and is in operation, treating about 100 tons of zinc-middling from the Daly Judge mill, with which company the Grasselli management has a contract. At the Daly Judge mill are more than 20,000 tons of such middling, containing from 20 to 35 oz. zinc, 2.5 to 4% lead, and from 5 to 7 oz. silver.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Cobalt is remarkable for its ductility and tensile strength. It is the most tenacious of the commoner metals, being about twice as strong as iron when drawn into wire.

Cost of grading wagon roads will average from 30 to 60c. per cubic yard of earth to be handled, where no blasting is needed. The variation in cost depends chiefly on the scale of wages paid and the expense of maintaining teams. The above cost assumes the use of ordinary drag-scrapers.

Contact minerals formed when an igneous rock is intruded through limestone are chiefly garnet, wollastonite, vesuvianite, wernerite, pyroxene, and amphibole. The limestone itself would be converted into marble, which for some distance from the igneous rock would contain silicates such as those mentioned above.

Borax glass, not borax, should be used as a flux in melting gold precipitate from the cyanide process. Borax contains a large quantity of water of crystallization, which must be driven off by heat before the flux can combine with the silica and base-metal oxides present, and hence causes loss of precious metal by 'dusting.'

Carbonic acid gas is manufactured chiefly from limestone. A small quantity is made from magnesite, the residue being a valuable by-product. The total production of magnesite is small, coming almost exclusively from California, where the output in 1907 amounted to 6405 tons, estimated to be worth $57,720. Considerable magnesite is imported to the Atlantic sea-board, and efforts are being made to place a duty upon it, in order to benefit the owners of magnesite deposits in California.

Dipper dredges have not proved successful in gold-dredging operations. Their successful application in contractors' work, their adaptability to all sorts of conditions, and their relatively high capacity have led many mining companies to experiment with them, leading usually to disastrous results. A 2½ cu. yd. dipper dredge would cost from $40,000 to $50,000, and it should dig on an average 1500 cu. yd. of gravel per diem of 20 hr., allowing 16⅔% loss of time for proper maintenance.

Combustion-products from the detonation of dynamite under perfect conditions possess only one injurious gas, carbon dioxide, and this, instead of acting as a poison, merely reduces the amount of oxygen needed for the blood, and can produce death only when present in the air in quantities exceeding 12%, the effect being that of asphyxiation. But perfect combustion of dynamite never occurs in practice, and carelessness in making primers and in loading holes for blasting promotes the formation of carbon monoxide (CO) and nitrogen peroxide (NO_2), the former being an active poison and the latter producing serious injury to the epithelium of the lung tissues, which predisposes the sufferer to pneumonia.

Ore reserves adequate for safety in continuous mine-operation can not be stated in terms of any fixed number of years' supply. The farther ahead one can see, the better, and a wise manager will push development so as to give ample time for more extended exploration of the deposit in case the development workings for a year or two should prove unproductive. In the initial stages of a mining enterprise it is important to have sufficient ore blocked out to pay for reduction works after meeting operating expenses and fixed charges, before incurring the expense of erecting a plant. This advice seems so obviously in line with simple business judgment that the only reason for giving it is that mining companies usually do not wait until they can prove a warrant for such an outlay.

Regeneration of cyanide solutions after precipitation of the precious metals with zinc is not practiced, although A. F. Crosse several years ago proposed a method which seemed entirely feasible. The zinc-potassium cyanide in his tests was acted upon by sodium sulphide, at about 65° C., as follows:

$$K_2Zn(CN)_4 + Na_2S = ZnS + 2KCN + 2NaCN.$$

The zinc sulphide was coagulated by the addition of a little lime, causing it to settle readily. To prevent accumulation of caustic alkali in the solution, Mr. Crosse collected the ZnS and used it to generate H_2S, which he passed through the solution after treatment with Na_2S. The two following reactions result:

$$K_2Zn(CN)_4 + Na_2S = ZnS + 2KCN + 2NaCN.$$
$$HCN + KOH = KCN + H_2O.$$

Mr. Crosse reported extractions of gold from Transvaal ores as high as 91% with this regenerated solution.

It is reported that the Government will specify delivery of cement-clinker instead of ground cement, for use at Panama, and will grind the clinker on the spot as needed. This would seem to be a rational proposal, from several points of view. Unground cement-clinker does not deteriorate from the effects of moisture. In fact, it may be drenched and then dried without impairing its quality. Clinker is a crystalline aggregate, and when properly burned the crystals are vitreous in lustre and a dull green in color. Imperfect burning can be immediately detected in clinker, but in ground cement this cannot be done. Adulteration is also impossible. Many cements are adulterated either with 'natural' cement or with raw ground limestone, thus weakening a really superior article as far as may be possible without impairing its ability to pass the specifications, thus increasing the manufacturer's profit. The Government's plan would insure the delivery of an honest cement, and losses in transit would be reduced to a minimum.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Tailing-Wheels or Pumps?

The Editor:

Sir—I have been greatly interested in the articles by Walter L. Reid, A. H. Jones, and others which have appeared recently in the columns of the MINING AND SCIENTIFIC PRESS, concerning the comparative merits of tailing-wheels and centrifugal pumps. It has been my fortune to have had a certain amount of experience with various types of elevating machinery during the last few years. I remember when the original tailing-wheel mentioned by Mr. Reid was installed at the Smuggler-Union 60-stamp mill, and can vouch for the fact that up to the time when I left Telluride (probably about one year after the wheel was put into commission) it had given no trouble whatever. That particular tailing-wheel was built upon an old engine flywheel taken from the Pandora mill belonging to the same company. I do not know what power was required to operate this tailing-wheel, but doubt if it exceeded 15 horse-power.

My results with centrifugal pumps have not been particularly good. The cost of maintenance, both for labor and repairs, reaches a high figure, while the power requried to operate them is a serious item, especially in a mining district where power is sure to be expensive. The first cost for installation is of course considerably less than that of a tailing-wheel. In general, however, my experience would lead me to favor the tailing-wheel in preference to the centrifugal pump for constant duty against a moderate lift (up to say 30 ft.). Beyond this height, the first cost of the wheel would be a serious item, and in most cases it is probable that it would be better policy to install some cheaper form of elevator. For an intermittent load, especially where time is an important factor, I should certainly favor the centrifugal pump. For the elevation of large quantities of mill-pulp to a moderate height, however, I am strongly in favor of using the Frenier sand-pump as compared to either the tailing-wheel or the centrifugal pump. The advantages are its light weight and low first cost, extreme simplicity, and low repair-cost. At the Montana-Tonopah mill we are using three 10 by 54 in. Frenier pumps (one spare and two in operation) to elevate our mill-pulp for re-concentration after re-grinding. They have now been in constant use for over a year, and the total cost for maintenance will not amount to more than $50. We estimate that the two pumps elevate on an average 1100 tons of pulp per day (155 tons dry sand and about 930 tons of water) to a height of 18 ft. with a power consumption not to exceed 9 to 10 hp. The pulp contains very little coarse sand, as daily screen-analyses show that about 80% of the material, although fine sand, will pass a 200-mesh screen and the wear would naturally be much greater with coarse sand.

At the Combination mill at Goldfield, however, we used the same pumps to elevate pulp before tube-milling, and the results compared favorably with those obtained with centrifugal pumps on a finer material. The principal trouble experienced when pumping coarse sand was the wear on the bearings from the gritty water, but this can be obviated to a considerable extent by extending the bearings, and by protecting them from the splash of gritty water. A certain amount of trouble was also experienced because of the pumps becoming flooded when lifting beyond their proper capacity. In my opinion the whole secret of success with the Frenier pump is to keep the height of discharge against which the pump has to lift well below the capacity claimed by the makers (Frenier & Son, Rutland, Vt.). If this is done no trouble will be experienced from flooding. At the elevation of Tonopah (6000 ft. above sea-level) the 10 by 54 in. pump is efficient for lifting to a height of 18 or 19 ft. Beyond this height I would recommend using two or more pumps in series.

EDGAR A. COLLINS.

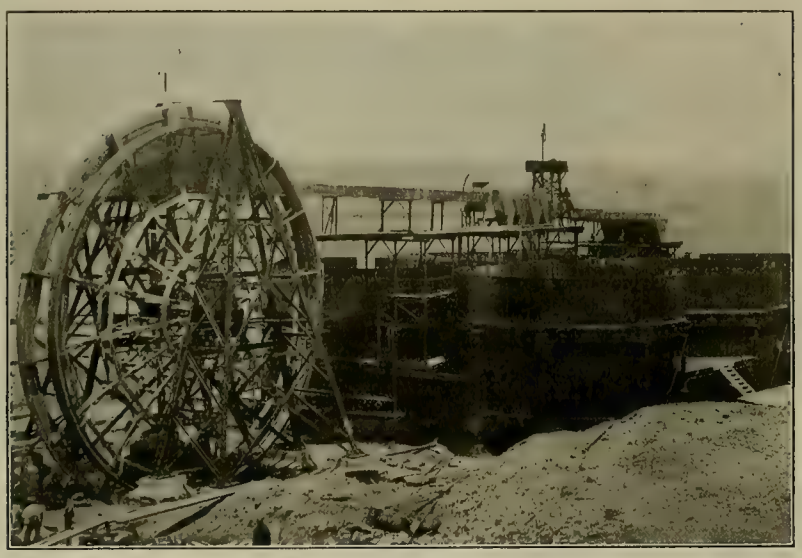
Tonopah, Nevada, October 14.

The Editor:

Sir—South African engineers are considering at present the advisability of discarding the tailing-wheel in favor of some other contrivance for raising the ore-pulp from the mill to the cyanide-plant. Tailing-wheels erected on the Rand before the war have been subjected to a severe test, on account of the complete suspension of the work during hostilities. While at work the rim of the wheels and the interior of all the buckets are always wet. During the stoppage of the mills the wheels were continuously exposed to the scorching sun during the dry season, and during the wet season a portion of the buckets were alternately filled with water and again dried out.

Among the many tailing-wheels then existing were two, both double wheels, that is, with two lines of buckets each, owned by the same company, built from the same design, under the same superintendence, by the same gang of men. They were in every respect alike. Each of these wheels had to raise the sand from a 200-stamp mill, with stamps of 1250 lb. weight, crushing about 5¾ tons of ore per day. They were thus lifting 1150 tons of pulp, together with a large amount of water. One of these tailing-wheels was installed at the Rose Deep and the other at the Crown Deep mill. They had an inside diameter at the bottom of the buckets of 46 ft.; the number of buckets was in each case 128, each 15 in. wide by 12 in. deep. The space between the two wheel rims was 20 in., and served as a belt-drive for the wheel, with a diameter of 39 ft. The wheel-shafts were 9 in. diam. in the centre and 8 in. diam. at the journals. The bearing-blocks rested upon the top of hammer-dressed stone piers, laid up in cement. These piers stood about 30 ft. high above the foundation. The wheels made about 4 r. p. m., which gave a peripheral speed at the bottom of the buckets of 9 ft. 7½ in. per second. The wheel at the Crown Deep resumed operation evidently with-

out any trouble; the wheel at the Rose Deep broke down, and was the cause of subsequent agitation against tailing-wheels. Another typical wheel is the double wheel of the Ferreira Deep, 60 ft. diam., comprising various improvements. The space between the two lines of buckets was again used for the drive, but in this case contained 4 grooves for 1¾-in. manila rope at a diameter of 55 ft. The rope-drive contains a tension-carriage to overcome the variations in the length of the endless drive-rope, caused by the rope being alternately wet and dry on account of the extremes of temperature and moisture-conditions prevailing. By this tension-gear the tension of the drive-rope will constantly be the same. The shaft of this wheel is 14 in. diam. in the middle, and 12 in. at the journals. Another improvement in the Ferreira wheel consisted in the substitution of steel A-frames for the stone piers in support of the wheel-shaft. The four inclined posts of each A-frame are anchored to four small concrete piers, and there is also a horizontal connection between both A-frames above the wheel, which gives stiffness to the structure. This wheel makes 3 r. p. m., equal to a peripheral speed of 9 ft. 5 in. per second at the bottom of the buckets. The accompanying illustration shows the Henry Nourse wheel, with a single line of buckets. In front is seen the endless-rope drive, and also the A-frames with their top-connection and the column-footings, anchored to the eight small concrete piers.



Tailing Wheel of Nourse Mill, Transvaal.

The evolution in the construction of the tailing-wheel has now progressed so far that it may be justly asserted that the wheel is substantial enough to last as long as the cyanide plant to which it is attached, subject to no important interruptions, and not involving any extensive repairs.

At one of the Rand mines, where a tailing-wheel had been installed, a further addition to the cyanide plant had been constructed; the discharge-level of the original wheel was no longer high enough for the additional plant; a second tailing-wheel was then installed, taking the pulp from the first wheel, and delivering it at the receiving-level of the new works, and both wheels have been working together with the same pulp for years.

In centrifugal pumps, the white-iron, or the manganese-steel linings, the pump-blades, and finally the shaft and bearings, will wear out rapidly, so that the pump will soon be worthless and beyond repair, and a new pump has to be substituted. At a number of the smaller Rand mines single-acting plunger-pumps, ranging from 12 to 16-in. diam. by 48 to 60-in. stroke, have been installed. These pumps require rather extensive foundations, and a very strong head-frame. These plunger pumps, and especially the valves, wear out very fast, and they require the constant attention of the engineers, and a couple of pumps will keep one machinist busy on repair work all the year round. The tailing-wheel in varying sizes and forms has been in constant use at many kinds of metallurgical works for a century or more. Engineers have frequently conspired against it, but it enjoys periodical revivals of favor. Tailing-wheels of moderate size, when working under shelter, may be constructed lighter and cheaper. The high efficiency of this device is indisputable, its steady working, and comparative freedom from interruption and repairs far outweigh the disadvantage of higher prime-cost and greater floor-space occupied.

G. W. Wepfer.

San Francisco, October 6.

Vesicular lava owes its porosity to the expansion of occluded gases upon relief of pressure. This indicates proximity to the surface, either in lava that has overflowed, or that has risen near to the top of a dike or volcanic pipe. It is conclusive proof that the rock did not consolidate at any considerable depth. The extreme result of sudden expansion of occluded gases in lava is the production of lapilli which form masses of tuff.

HINDS CONSOLIDATED MINES, MEXICO.

Written for the MINING AND SCIENTIFIC PRESS
By S. F. SHAW.

The property of the Hinds Con. Mining Co. is situated in the Santa Barbara mining district, in the State of Chihuahua, Mexico. The holdings of this Company consist of 63 pertenencias, or 155½ acres, having an average length of 6600 ft. and a width of 1020 ft. Three parallel veins traverse the property, having a general northeast strike, dipping about 70° to the southeast.

The Clarines vein is the principal one worked. It extends the entire length of the property, having a width varying from 4 to 30 ft. The Clarines, Reforma, Remedios, and Santa Gertrudis workings are all on this vein. The Clarines workings have a depth of 200 ft. below the adit, which extends into the mountain along the vein a distance of 1200 ft., and reaches a point 275 ft. below the vein out-crop at the highest point. The stopes along these workings are extensive, and those below the adit have been filled with waste, as the ore has largely been worked out. A drift from the Reforma shaft, 185 ft. below the collar, connects with the fourth or bottom level of the Clarines mine. From this shaft, for a distance of aproximately 350 ft., the ore is composed of sulphides in a quartz gangue. At this point a dike about 2 ft. thick cuts diagonally across the drift, and beyond this dike, where the Clarines workings commence, the ore is nearly all oxidized.

On the third level of the Reforma mine, 285 ft. deep, a drift extends N.E. a distance of 185 ft. The width varies from 15 to 30 ft. The face of the drift is about 20 ft. wide, and is in a body of lead ore, completely oxidized. This oxidized orebody occurs directly below the sulphide ore previously mentioned. The Remedios mine joins the Reforma, and the Remedios shaft is about 2200 ft. S.W. of the Reforma shaft. The Remedios shaft is 280 ft. deep, and has two levels aggregating 1600 ft. in length. A large stope about 20 ft. wide has been opened at the north end of the first level, at a distance of 190 ft. from the shaft. There is also a cross-cut to one of the parallel veins. The Santa Gertrudis workings are reached by a shaft 225 ft. deep, and by an adit 600 ft. long. From the shaft are levels aggregating 650 ft. of work.

The vein in all the workings yields mainly an oxidized lead ore carrying varying amounts of gold and silver. The principal economic minerals recognized are anglesite and cerussite, with streaks of copper minerals, such as chrysocolla, malachite, azurite, and chalcocite. Shipments of 5 to 9% copper ore have been made from the sorted material. Where sulphide ores are found the galena is accompanied by sphalerite, pyrite, and a small amount of chalcopyrite. The gold and silver is more uniformly disseminated than in the oxidized ore.

The ore from the Reforma shaft and from the Clarines adit is trammed to a grizzly made of mine rails. The oversize is fed to a 9 by 15-in. Blake crusher, set to 1½ in., and falls into a bin, joining with the fines from the grizzly. A plunger feeder delivers the ore from this bin to a 24-in. Robins picking belt, on which is sorted out the shipping ore. The mill-ore falls to a bin below the picking belt from which it is carried to the mill, a distance of 2170 ft., by a Leschen Bros. double-rope automatic aerial tram, having a capacity of 25 tons per hour. At present the mill is not running, so the fine material is trammed to 20 compartments of hand-jigs and 4 planillas, which are placed just below the crusher bin. These jigs make a concentrate said to average 4 gm. gold, 730 gm. silver, and 35% lead, discarding a tailing averaging 1 gm. gold, 60 gm. silver, and 1.5% lead. One man jigs about 4 tons per day, making about 0,4 ton concentrate and slime.

The main or Reforma shaft is equipped with a 10 by 12-in. double-drum geared hoisting engine, using a 1-in. wire-rope to hoist the cage and bucket. From the collar to the second level there are two compartments, while three compartments are sunk from this level. At the Reforma, compressed air is supplied by a WB2, 16 by 18 by 11 by 16-in. Sullivan two-stage compressor, having a capacity of 600 cu. ft. of free air per minute at this elevation, and a Rand Imperial two-stage compressor having a capacity of 800 cu. ft. of free air. Machine drills are used for drifting, and various air-hammers for stoping. Light is supplied by a 7½ kw. Westinghouse direct-current dynamo, operated by a 7 by 10-in. Erie City Iron Works single-cylinder balanced-valve engine. Steam for running the hoist, air-compressors and dynamo engine is supplied by three 125-hp. Frost boilers. These boilers also supply steam for the Frost engine which drives the crusher and picking belt.

The mill flow-sheet is as follows:

(1) From aerial tram-bin to (2).

(2) Grizzly made of mine rails, ½ in. openings, oversize to (3), undersize to (4).

(3) 9 by 15-in. Blake crusher to (4).

(4) Crusher-bin, to (5).

(5) Plunger-feeder, to (6).

(6) 6 by 4-in. Sturtevant duplex crusher, to (7).

(7) Trommel, 36-in. diam., with ¼-in. round-punched openings, oversize to (8), undersize to (12).

(8) 24-in. Robins picking-belt, to (9).

(9) Mill-bin, to (10).

(10) Plunger-feeder, to (11).

(11) 42 by 14-in. Traylor Eng. Co. rolls, to (12).

(12) Elevator, to (13).

(13) 2 concentric trommels, oversize from 4-mesh openings to (11), oversize from 6-mesh openings to (17), undersize to (14).

(14) 2 Richards hydraulic classifiers, underflow to (18), overflow to (15).

(15) Box classifier, underflow to (19), overflow to (16).

(16) Cone-settler, underflow to (20), overflow to dump.

(17) 4 Traylor Eng. Co. 4-comp. jigs, concentrate to smelter, tailing to dump.

(18) 4 Traylor Eng. Co. 2-comp. jigs, concentrate to smelter, tailing to dump.

(19) 2 ditto.

(20) 2 ditto.

The fine tailing, with most of the water, goes to 4 Callow cone-settling-tanks in parallel. The overflow from these tanks is pumped to the mill supply-tank by a 9 by 8½ by 10-in. Worthington duplex pump. The water draining through the dump is collected in a basin below, and is then pumped back to the mill supply-tank by an 8 by 6 by 10-in. Knowles duplex pump. The power plant consists of one 150-hp. Erie City Iron Works boiler, supplying steam for a 15 by 20-in. single-cylinder Atlas engine, which drives the mill machinery, and a 7 by 10-in. Erie City Iron Works single-cylinder balanced slide-valve engine. This small engine is used to operate a Westinghouse 7½-kw. direct-current dynamo, which furnishes light for the mill and for the Remedios mine. The power required to drive the mill machinery is 110 hp., with a consumption of 8¼ cords of wood per 24 hr. The saving made in the mill is about 48% of the assay-value. The ore treated is largely oxidized, which accounts for the low extraction. There is on the ground sufficient crushing machinery and 'bull-jigs' to raise the capacity of the mill to 225 tons per diem. There has been ordered a complete re-grinding and fine concentrating equipment to handle 200 tons per 24 hr., consisting of two 8-ft. Hardinge tube-mills, 12 James slimers, and 8 James tables, which will probably be installed by December 15. The mill in the meantime will not be operated unless there is a definite advance in the price of metals. The concentrate is hauled from the mill to the Mexican Central R. R. over a private broad-gauge track belonging to the company, a distance of 2¾ kilometers, by a 40-ton American Locomotive Works saddle-tank locomotive. Wood and other supplies are also hauled over this spur. W. W. Elmer, general manager of this company, has kindly supplied most of the figures used in this article.

Hinds Consolidated Mill, Santa Barbara, Mexico.

Pneumatic stamps are again being tried in the Transvaal goldfield. The New Kleinfontein is to erect an experimental mill equipped with a new type of these stamps.

Patents to a total number of nearly 900,000 have been issued in the hundred years which marks the existence of the United States patent office.

Pumice is a term applied to a form of volcanic rock which may be either massive or in a finely comminuted state. The massive variety is largely imported from the Lipari islands. This rock owes its peculiar porous, vesicular, or pumiceous condition to the rapid expansion of occluded moisture or gases on the sudden release of pressure at the time of its ejection from the volcano. This expansion may be carried to such an extent that the rock is completely shattered, and the resultant finely powdered material may be carried to unknown distances by wind and air-currents and then deposited in beds. This explanation is usually assigned to the Nebraska deposits. Practically the entire State of Nebraska is said to be underlaid by natural pumice, deposits of which extend as far east as Omaha. The extent and thickness of the beds are evidence of extraordinary former volcanic activity. North of Nebraska, in the heart of the Bad Lands of South Dakota, beds of pumice 10 to 15 ft. thick have been noted. In Scotts Bluff and Banner counties, in the western part of Nebraska, there are beds 100 ft. thick, which, though not consisting wholly of volcanic ash, have been rendered white by it. The material in individual beds differs greatly in purity, texture, and physical condition. Some is pure white; some is adulterated with silt, sand, clay, and particles of limestone. In texture also it exhibits great variety, the materials being found in almost every stage of consolidation, from incoherent dust to fairly compact rock. Nearly all the material is used for abrasive purposes, either in the form of polishing powders or soaps. Deposits of a substance resembling volcanic ash occur in three isolated beds lying within a radius of four miles from Durango, La Plata county, Colo. The material, which is similar at the three localities, is a dustlike powder of white opaque flakes, glistening in the sunlight, and is gritty and entirely unconsolidated. Some of the possible uses for this material are in semi-fused filling-brick, in fire-proofing, and in mineral-wool for packing as a non-conductor of heat and sound. In its natural condition it might also be used in refrigerating plants, in the manufacture of puzzolan cements, and in some of the cheaper varieties of glassware. The production of pumice in the United States in 1907 amounted to 8112 short tons. The price realized was $4.17 per ton.

The production of copper in the United States, Mexico, and Canada during September is estimated to have been 102,509,125 lb., an increase of 34,120,325 lb., as compared to the corresponding month a year ago, and 4,547,125 lb. more than September, 1906. Owing to the restriction of production at Butte early this year, it is probable that Arizona will be the leading copper region for 1908.

BETTER PROTECTION OF MINE INVESTORS.

Discussion by the New York Section of the Mining and Metallurgical Society of America.

H. S. Munroe.—The subject may be considered under three heads, corresponding to the three principal phases in the life of a mine, namely, prospecting, development, and working. Each of these three phases presents its peculiar problems. Mining differs from other industries, in that the risk of failure is much greater, and that, as far as any given property is concerned, the business is necessarily a temporary one. On the other hand, the profits may be great.

The risk of financial loss and chances of failure in mining are greatest at the beginning. The vast majority of mineral deposits are not workable. The prospector's chance of success is small, and most of them live and die poor men. The investment of capital in prospecting is about as profitable as stock-gambling, and the investor is fortunate if his gains balance his losses. To maintain the supply of mineral products necessary to modern civilization, new deposits must be discovered and developed as the old are exhausted. In all civilized states this necessity is recognized, and every encouragement is given to those who search for and develop the mineral wealth of the country. In the discovery and development of new mineral deposits the expenditure of time and money is out of all proportion to the results obtained. Out of thousands who have rushed to new mining regions, the great majority have returned poorer than they went, and many have lost life as well as time and money. But little can be done to check this economic waste of money and human energy. The spirit of adventure and the desire for great wealth quickly gained cannot be controlled. The best that can be done is to aid and guide the prospector and increase his chances of success, and lessen the inevitable hardships as far as it is possible to do so. This is a proper field for Government activity. Effective protection of life and property, carefully framed and wisely administered mining laws, and the scientific study of mineral deposits and their geological relations by trained mining geologists, may do much to lessen the economic waste and great losses incident to the original discovery and development of the mineral resources of the nation.

There is also great economic waste in the development of mines. Out of several hundred promising discoveries, but one or two become profitable mines. Each of these unsuccessful enterprises will have hundreds or thousands of dollars expended upon it before work is abandoned, and the annual waste of wealth in such unproductive mining ventures is very great. In the early history of any mining enterprise a certain risk must be taken. It is impossible to determine the worth of most mineral deposits without the expenditure of much money in development work. In the majority of cases, however, through ignorance or over-confidence, and sometimes through dishonest management, much larger amounts are expended than are at all necessary to prove the value or worthlessness of the property. Unfortunately, this loss of money by unwise and unnecessary expenditure falls on those who are least able to afford such loss. Large capitalists can command the services of skilled mining engineers, and rarely undertake development of mining properties unless the chances of success are good and the risk of failure is small. If it were necessary to depend entirely on men of large resources for the initial development of new deposits, but few new mines would be opened, and the industry of mining would be more likely to decrease than to increase in importance. The original work of development, and the work of proving the value of new discoveries then falls on the prospector and his associates, the small capitalists whom he can succeed in interesting in his discovery. This has proved a rich field for the unscrupulous promoter, who forms a connecting link between the prospector and the small investor, and preys upon both. Mining as a business is of necessity attended with risks, especially at the beginning, when the extent and value of the deposit are unknown. The risk is offset by the chance of large gains if the property proves valuable. Mining must be carried on by those who are willing to take these risks, in the hope of winning one of the prizes. The many failures tend to make the investing public more cautious, but nevertheless, the unwise and unnecessary expenditure of money in the development of mineral resources is a serious waste, which well deserves the consideration of economists and statesmen.

The multiplication of mining schools in all parts of the world undoubtedly does much to check this economic waste by furnishing a large body of trained students of mining, who develop in time into mining experts competent to advise investors, and lessen unwise and unwarranted expenditure. The work of the United States Geological Survey, and the bulletins and monographs on mining regions, has done much to lessen unwise expenditure and increase the chances of success in the development of mineral properties in this country. Whether it is wise or practicable for the Government to concern itself with individual mines or mineral properties is doubtful, but it is a proper and perhaps may prove a profitable subject for discussion. While the property is under development by the prospector and his associates, governmental interference is impracticable. The authorities can offer aid and advice only. When, however, a public corporation is formed, seeking capital by public subscription, such company must be organized under State laws, and may be controlled. It has been suggested that an application for a charter should be accompanied by satisfactory evidence of real value of the deposit to be worked. If some such provision can be incorporated in the laws of the principal States, with suitable machinery for its enforcement, and effective provisions against abuse, great good might result.

The tendency on the part of the investing public to exaggerate the value of productive mines also tends to the ultimate injury of the mining industry. The uncertainties attending the development of mining properties, and the possibility at any time of

new discoveries adding greatly to the value of the mine, tend to encourage speculation in mining stocks. Mine investors are naturally sanguine, and it will always be impossible to prevent or even control this speculative tendency, which is by no means confined to shares in mining enterprises. Old and well developed mines, however, are rarely subject to such fluctuations in their actual value as is the case with smaller and undeveloped properties. There is no reason why such properties should not be removed from the speculative class of investment and recognized as a form of legitimate business. To this end the mining investor should be better informed as to the real character of the business of mining. This duty properly falls on those in charge of such mines, and to those who are called upon from time to time to advise investors as to the value of mining properties. It should be strongly impressed on the investing public that mining differs radically from other productive industries, in that it is of necessity a temporary business. Every mineral deposit is sooner or later exhausted. The business of mining must be so managed that the money paid for the mineral property, expended in its development, and spent for the necessary plant shall be repaid from the earnings during the life of the mine. Certain mines may have a very long life and the amortization charge per year may be small. Other mines are likely to be short-lived. In the majority of cases a mine should earn not less than 20% on the investment to be profitable. The actual value of a mine is not often more than five times its annual earnings. The shares of well known and profitable mines are frequently sold in open market on the basis of 10 or 12 times the annual dividends. The purchaser at such prices usually makes an unwise investment, and sooner or later must face serious loss. This is particularly the case when the earnings of the mine are temporarily above the average because the mine is in bonanza, or because the product commands for the time being a high price in the market.

This tendency toward the over-valuation of the shares of successful mines and the great waste of money in unsuccessful enterprises, and the large losses to investors resulting therefrom, work greatly to the disadvantage of the mining industry, and tend to check its development, by increasing the difficulty of raising the necessary capital. It is therefore to the interest of any mining State, by wisely framed mining laws, by well organized geological surveys and well endowed mining schools, and by well considered legislation looking toward the better protection of mine investors to lessen this economic waste, and to endeavor to place the business of mining on a saner and more conservative basis. The mineral resources of any State constitute an important source of wealth which should be wisely administered for the advantage of the people.

J. R. Finlay.—During the past year a rather extended study of the reports of American and foreign mining companies, undertaken for the purpose of finding out as much as possible about the value of their various properties, has impressed me not only with the lack of uniformity in making statements, but with the apparent lack of a feeling of responsibility by the directors of a large proportion of the American companies in the matter of giving their shareholders any adequate information regarding the conduct of the business. It seems to me that the Mining and Metallurgical Society of America might use its influence to show to managers of mining companies the necessity and desirability of giving their stockholders such reports as will enable these to form a legitimate idea of the value of the business in which they participate. It is well forth considering whether we cannot, after a full discussion, recommend to the public a form of official statement which will include the minimum of essential facts that will be acceptable. It may be possible even to recommend legislation by the States to compel companies to furnish proper information.

Some of the largest concerns are the worst offenders. For example, the United States Smelting, Mining & Refining Co. issues a report containing the following information: List of officers; statement of earnings for the year; output of metals; balance sheet; statement of capital stock and securities issued; a general perfunctory description, without any details, of various properties owned. In selecting this statement I am not picking out by any means the worst example. This report does give information. The criticism to be made, however, is that it goes through the motions of giving information without disclosing anything really vital. It does not show the value or resources of a single one of the properties, gives no idea of the cost of operating any of them, of the ore resources they contain, nor of their probable life. With these essential factors left out, the stockholder is compelled to make an absolute guess as to the value of his property. The statement of earnings means nothing unless one knows how the earnings are obtained. It is conceivable that earnings might come from some sources of quite temporary character. It is also conceivable, and very often happens, that the so-called earnings are only nominal, because a large portion of them may have to be put back into the property for various reasons.

It may be said as an excuse for this type of report that a large concern like the United States Smelting, Mining & Refining Co. owns too many properties to be readily described, and that a report so describing them all might be too cumbersome and expensive. If such a feeling is in the minds of the managers of these corporations, it seems to me our influence ought to be directed to relieve them of it.

Most English mining companies give information that, I believe, is prescribed by laws which are nearly uniform throughout the British Empire. Without going into unnecessary detail, I may cite as an example the report of the Great Fingall Consolidated, of West Australia, managed by Bewick, Moreing & Co., of London. This report contains the following features: Notice of advertisement of the general meeting of the stockholders to receive reports; list of directors and officers; report of the directors, giving a general account of the condition of the property, including the amount of develop-

ment work, the tonnage mined, the values recovered, the costs of operating and profits for the period reported on; balance sheet of the company's account; profit and loss statement, including a revenue and working cost statement; appropriation statement, showing the disposition made of all earnings; report of the managers, including details of development, ore reserves exposed on three sides, probable ore not so thoroughly exposed, working expenditures, construction accounts, general remarks on the condition of the property, and a map of the property. When these points are fully covered in a statement over the signature of the responsible officers, and are duly published, the stockholder can be pretty sure of knowing about what his interest is worth to him.

Some companies, both in this country and in England, go still further. The Tennessee Copper Co., for instance, covers a point included in the Great Fingall report in a rather better way than the ordinary, by including in the balance sheet, not the ordinary perfunctory statement of assets and liabilities, but an actual record of the capital expenditures on the property from the beginning, in considerable detail. This is a most important point, and, I believe, should be included in a really satisfactory report. Some companies, notably the Alaska Treadwell group and the mines managed by John Taylor & Sons, of London, give in addition an abstract of the results obtained from the mines from the beginning, including the tonnage and values realized each year, the working profits and the dividends paid each year, with the totals for the whole period. This information, put into compact statements, throws into relief the present performance of the property, compared with its past performance, which is perhaps the most vital factor in sizing up its condition.

Elaborating on this idea, F. W. Bradley has recently issued a circular to the stockholders of the Bunker Hill & Sullivan Mining & Concentrating Co. that goes a step further.* It gives the estimate of ore counted on, with the methods used in making the estimate, and then proceeds to give the actual record of the property from the beginning, including the average assay-value and average recovered value of the ore at various periods, the tonnage produced, the complete cost of operating, the expenditures for plant, the prices obtained for metals, and the market conditions that have ruled at the various periods, and the dividends paid. From this is obtained a forecast of future expectations made up by Mr. Bradley from a consideration of these data.

There may be great difficulties in the way of furnishing certain information, but it seems to me that, as a general thing, a stockholder in a company is justly entitled to whatever knowledge of the property may be necessary to enable him to know its value. This matter has become more or less a political question in the last few years, and a definite call for settlement of it is likely to be made.

Edward L. Dufourcq.—The society as a body can practically do nothing to protect those who are venturing into the field of opening prospects, because the very nature of the work undertaken at this stage of mining operations involves more than the ordinary 'mining risk.' The degree of reasonable expectations for each district must be made a special study under conditions that vary widely, and no set rules as to what information a stockholder should have in a company undertaking such operations can be laid down. The only protection that he can look for is in the advice of a reputable engineer who has studied the particular district.

In considering what may be set by the society as a standard for the reports of companies actually operating, whether quarterly, semi-annually, or annually to be rendered to stockholders, it must be remembered that producing companies pass through two stages, namely, that in which new capital is continually being applied for installation and increase of plant, during which the company approaches its maximum of output, and that in which, the maximum having been attained, the shares generally reach an inflated value, when unscrupulous 'insiders,' taking advantage of information withheld from the average stockholder, find an opportunity to unload their holdings. It is in the latter stage especially that the exaction of complete information as to the condition of the mines and plant may be of value in the protection of stockholders and investors.

The annual statements of operating companies should be required to show, among other matters: (a) Amount of expenditure on capital account, and whether for plant, properties, or in case some of the development work is charged to such account, the proposed rate that this is to be charged off subsequently to operating account. (b) Operating expenditures, showing what part of same is for direct operations, and what for repairs and renewals; also what amount is used for mining developments. (c) Administration expenditures, showing salaries paid to officials and the cost of maintaining the home office, and legal expenditures. (d) Gross and net value of ore, bullion, or other product realized during the year. (e) Tonnage and grade of ore in sight and on the dumps and the net estimated returns from same. (f) Division of profits into amounts applied to dividends and the amount carried to reserve or to surplus.

In requiring information covering the above points to be set forth in the annual statement of operating companies, we must remember that a great many mining companies in reality are only holding companies. In the case of a holding company, the annual report should state the amount of its holdings in each of the subsidiary companies, and information as to each of the subsidiaries should be available along the lines indicated for operating companies.

I do not believe that immediate benefit could be obtained by the establishment of a Federal Bureau, since the occasions for delay in spreading information through means of a Federal Bureau would be too many, and there would be too many opportunities for evasions on the part of companies in furnishing the information. What the Society can best hope

*'Variations in Mining Costs,' MINING AND SCIENTIFIC PRESS, July 4, 1908.

to do is to force its standard for reports upon those companies which will hope to retain the confidence of their stockholders by having the seal of approval of a well recognized body of reputable engineers.

Another point which the Society might hope eventually to have established is the undoubted right of an engineer, for his own protection as well as for the protection of investors, to insist upon the publication of reports in full, and not in part.

J. F. Kemp emphasized the importance of correcting the false ideas of the mining business which prevail in the minds of the general investing public. No adequate conception of the risks and difficulties exists, so that people of the best intentions are exceptionally easy marks. One cannot but deplore also the enormous capitalization characteristic of so many enterprises whose operations are carried on rather for profits in the stock market than from the ore. Of course, the old legal maxim of *caveat emptor* applies, but on account of prevailing ignorance and misconceptions, unfortunate conditions of this kind are all too characteristic of the mining business. The Society may well do what it can to cast its influence on the side of lessening these objectionable features and spreading accurate general ideas. As regards the fulness of publication regarding reserves and resources, wisely advocated by Mr. Finlay, no doubt many operators are somewhat justifiably apprehensive of the tax collector. Like other uninitiated people, assessors are influenced by the booming and exaggerated talk of the promoter, and are disposed to evaluate properties above what is just. A case in point is the Provincial Government of Ontario, whose disposition was manifested in the Parliament at Toronto, a year and a half ago, to tax the Cobalt and other Ontario properties on the basis of ideas of value, widely disseminated but scarcely warranted. At the same time, and with a proper appreciation of the need of caution in these and other regards, it might be very desirable to provide in the terms of incorporation, and as conditional thereto, for reports of a sufficiently detailed character to convey to stockholders, and others, facts of reliable significance.

W. Y. Westervelt.—While in entire sympathy with the movement to have the Society determine what it can best do to protect the investor in mining shares, I must admit that thus far I have been most impressed with the difficulties in the way. Take, for example, the attempt to give the stockholders an idea as to the value of their holdings by stating the profit-making value of the ore deposits: how is the question of the immense amount of modifying influences exerted by change of character in the ore, by development of processes, and by greater economies in size of the plant, which make such immense fluctuations in the value of the ore resources, to be handled?

The usual elaborate report, discussing the pros and cons of such influences, which is rendered by the engineer to the board of directors, would, I cannot but feel, be of very doubtful value in the hands of the average stockholder, who has neither time nor inclination, even though he possess sufficient knowledge of the business, to digest the purport of such reports. My experience has been that what the average successful investor (outside of the actual leaders of enterprise) wants to know is what his stock is worth today, or going to be worth tomorrow, and such question is so inextricably interwoven with the financial support, market conditions, and skillful business management of the property, as well as its intrinsic worth, that I am sure all will agree that the engineer cannot proceed with too much caution in advising as to the immediate dollars and cents value of a particular security. By this I do not mean to in any way attempt to discourage the effort on the part of this Society toward a wiser and more uniform publicity in the handling of public corporations engaged in mining business, but I am particularly impressed at the moment with a sense of the caution with which the subject must be handled, lest more actual harm than good be done.

Graphite appears in the market in three distinct forms—crystalline (or flake), amorphous, and artificial. All are used to some extent for the same purposes, but there are some uses to which each kind is specially adapted. The coarser and purer forms of crystalline graphite, known to the trade as lump graphite and chip graphite, are used for the manufacture of crucibles, pencils, lubricants, and electrotypes. Cheaper grades of crystalline graphite, known as dust and sweepings, are used in the manufacture of stove polish, foundry facings, and paints. Amorphous graphite is used for purposes where purity is not a prime requisite. Thus a graphitic rock mined in Georgia is ground and put into phosphates used for fertilizer, as a black color is demanded by consumers, on the supposition that it means better quality. In Michigan graphitic rock is ground for use in paint. The distinction between crystalline and amorphous (non-crystalline) graphite is, however, not easily defined. Some of the graphite that is termed amorphous differs from the crystalline only in the microscopic size of the flakes; on the other hand, amorphous graphite may be more closely related to anthracite coal than to crystalline graphite. An example is found in the Rhode Island deposit, formerly known as anthracite coal, but which now furnishes commercial graphite. The purest graphite is carbon with 0.05 to 0.20% of hydrogen, but the commercial grades of crystalline graphite contain clayey impurities, even the best, such as some of that from Ceylon, comprising as high as 15% of ash. Artificial graphite was first put on the market in 1907, and its production has increased steadily each year since that time. Although manufactured by a single company, the output for 1907 was of greater value than that of the combined production of flake and amorphous graphite. The material was first manufactured for use in electrolytic processes, but it is now sold for many of the purposes for which crystalline graphite is used.

The ruby sand of the beach bordering the Bering Sea at Nome contains garnets with the gold; it is to the color of these garnets that the concentration owes its hue and its name.

ZINC SMELTING FOR PIGMENT.

Written for the MINING AND SCIENTIFIC PRESS
By EVANS W. BUSKETT.

Zinc pigment in some form is the base of nearly all high-grade modern mixed paints. Formerly zinc oxide was considered an adulterant in white lead, and was, of course, under the ban. It was found, however, that zinc pigment added materially to the good quality of the paint. Consequently, in spite of the opposition it first received, zinc pigment has steadily encroached upon the field formerly occupied by white lead alone, until it has gained recognition as a standard paint.

In 1848 the New Jersey Zinc Co. built a plant at Newark, New Jersey, and attempted to smelt zinc by the Belgian method, but was unsuccessful on account of the presence of iron in the ores, which corroded the retorts. Richard and Samuel Jones then devised a process for the manufacture of zinc oxide, which was modified in 1851 by Samuel Wetherill. This process, with very little modification, is used by the New Jersey Zinc Co. at the present time. Zinc oxide and zinc-lead pigment may be made by the same process, and the same plant is often used at different times for the manufacture of either, as desired, the only precaution necessary being a thorough cleaning out before each change of product.

The ores used for the manufacture of zinc oxide are the sulphide and the carbonate free from lead. The presence of iron is not detrimental. Zinc-lead pigment is made from ores containing a mixture of zinc-blende and galena, zinc carbonate and galena, or a mixture of the three. These ores come largely from Colorado, New Mexico, and the Republic of Mexico. Before the development of the zinc-lead pigment industry these ores were waste products, being too low in lead, gold, and silver, and too high in zinc, for the lead smelters; and they were too low in zinc and too high in lead for the zinc smelters. Within the past 10 years two plants have been built, one at Canyon City, Colorado, and one at Coffeyville, Kansas, for the manufacture of zinc-lead pigment from such ores. This has created a demand for them, and thousands of tons have been made into zinc-lead pigment of a highly satisfactory quality. Any of the mixed zinc-lead ores of the West are adapted to this process, but ores free from antimony, bismuth, arsenic, and cadmium are preferred, as the presence of these substances is detrimental to the color of the pigment. Ores for use in this process should contain at least 30% lead and zinc combined. Ores of a lower content than this are too costly for smelting, in proportion to the amount of pigment produced. The amount of labor required to smelt low-grade ore is the same as for high-grade, while the amount of coal consumed is greater.

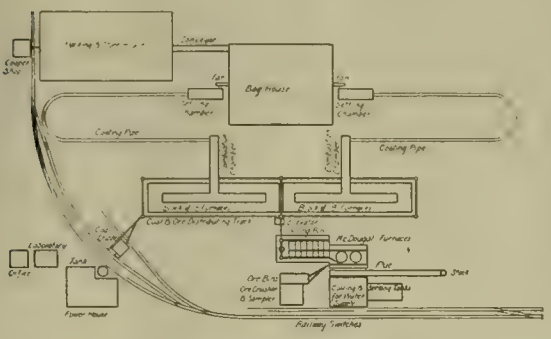
The proportions of the zinc and lead should be as near 2 to 1 as possible, this proportion making a pigment containing about two-thirds zinc oxide and one-third basic lead sulphate. An ore containing 22% zinc and 11 lead, or a total of 33%, would be a desirable one. If these proportions do not exist in the ores, they may be bedded in such a manner as to produce the proper mixture.

At the Coffeyville smelter the ores are bought on a 30% basis. For every per cent that the ore falls below that amount a 'dockage' is made, and for every per cent above a premium is paid. Gold, silver, and copper are not paid for, but the slags from ores containing these metals are saved, and shipped by the owners to the lead or copper smelters. The copper in the slags has been about as high as in the ores, there being no concentration. The silver, however, suffered a loss of from 25 to 50%, the amount depending entirely upon the heat at which the charge was smelted. The ores contained on an average less than 3 oz. silver per ton, and rarely more than 10 oz. Ores containing silver may be smelted by this process at a much smaller loss by maintaining a lower temperature.

The ores are paid for on the combined assay, and are umpired accordingly. When the assay on one of the constituents varies as much as 1% the ore is umpired. In umpiring both lead and zinc are assayed, although the difference might have occurred in the assay of only one of these metals. The settlement is made on the combined assays of the two metals as reported by the umpire. The ore as it arrives at the smelter is mostly coarse, having been hand-sorted at the mines. Only a small amount of concentrate is bought. Most of the ore comes from the Kelly and Graphic mines, Magdalena, New Mexico. It is unloaded at the crusher, which was built by the Allis-Chalmers Co. The crushing plant is equipped with Blake crushers, rolls, elevators, screens, and automatic samplers. The ore is crushed to ¼-in. size, and elevated to the bins. From the bins the ore goes to two McDougal furnaces, where it is roasted down to 3% sulphur. The ore originally contains from 15 to 25% sulphur. The two McDougal furnaces have a capacity of about 50 tons per 24 hours. The roasted ore is dumped into brick cooling-bins and is allowed to cool for several days before it is taken to the oxide furnaces.

The oxide furnaces differ materially from those used in the Wetherill process. They are built individually, being open on three sides, the back being built against a large flue. At Coffeyville the furnaces are in blocks of nine grates to the block. Two blocks are built with their ends opening into a combustion chamber at right angles to them, as shown in the plan. The grates are 6 by 12 ft., and are flat. The ash-pit under the grates is partially filled with water, to prevent the grates buckling. The grates are made of cast-iron, 1½ by 8 in. by 6 ft., perforated with holes ⅛-in. diam. and 1½ in. apart. The blast enters through these holes. The blast is furnished by two 3-ft. fans made by the American Blower Co. They are driven by a 30-hp. motor. The blast enters through the bridge-walls between the sets of grates, and passes into the charge through the holes in the grates. The products of combustion are carried off by a No. 160 American Blower Co.'s fan, situated at the bag house. This fan has a suction 4 ft. diam. and a discharge 3 ft. square. The bearings are water-cooled.

In operating these furnaces a layer of coal is first charged evenly upon the grates. When this is burning freely the charge of roasted ore and coal, intimately mixed, is thrown in and spread evenly. The door is now closed, and the ore begins to burn. If, after a few minutes, the door be opened, the whole interior of the furnace will seem to be ablaze with the oxides of the burning metals. The smoke, or fume, impelled by the powerful blast, rises and passes into the combustion-chamber, where the carbon and other impurities are burned off. Passing through the combustion-chamber, it enters the cooling-pipe,



Plan of Zinc-White Smelter, Coffeyville, Kansas.

which is of sheet-steel, 700 ft. long, its purpose being to cool the fume in order to prevent the burning of the bags. The cooling-pipe connects with another settling-chamber near the bag-room, from which the fume enters the large suction-fan which forces it into the bags.

Connecting with this fan at right angles is a sheet-steel conduit called the 'breech.' From this 18 conduits branch at right angles. These carry the bags for the sifting of the fume. There are 50 bags above,

Zinc-White Smelter, Coffeyville, Kansas.

each 30 ft. long, and 17 bags below that are 8 ft. long. The long bags are suspended from the girders at the top of the building.

The fume flows along the conduits and enters the bags, the gases being forced through while the pigment remains on the inner surface. The bags are shaken every four hours, when the pigment falls into the hoppers, and thence into the short bags. Every 24 hours the short bags are removed, and after cooling they are loaded into wheelbarrows and emptied into a conveyor at the end of the building, by which the pigment is carried to the packing room. There it is packed into barrels of 400 lb. each, using packing machines made by Barnard & Less, of Moline, Illinois.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

W. F. N., Battle Mountain, Nev.—No. 1, quartzite.

W. E. H., Pioche, Nev.—No. 1, shale; No. 2, metamorphic shale, with films of lime and dendritic manganese oxide.

R. E. F., Casa Grande, Ariz.—P, hornblende-biotite-andesie, somewhat altered; G, pegmatite; S. quartz-mica-schist.

A. Q. M. Co., Angels Camp, Cal.—No. 1, quartz mica schist with small amount of amphibolite schist; impregnated with pyrite now altered to limonite.

C. G. S., Silverbell, Ariz.—No. 1, metamorphic shale, perhaps a schist in the field; No. 2, silicified andesite; No. 5, rhyolite, perhaps grading into dacite in the field; No. 6, granite porphyry impregnated with pyrite and chalcopyrite.

F. S. S., Bakersfield, Cal.—No. 1, biotite-schist with a few sulphide crystals; No. 2, basic diorite, slightly schistose, traces of sulphides; No. 3, fine-grained schist, similar to No. 1; No. 4, yellow powder composed chiefly of calcium carbonate, making a marley soil.

H. A. C., Ingot, Cal.—No. 1, Lode matter, consisting of quartz and calcite, with iron oxide and some remnant of unoxidized pyrite; No. 2, iron oxide with zeolites, probably resulted from alteration of a very basic volcanic rock; No. 3, zinc-blende with quartz and calcite and a little galena.

C. E. S., Sweetwater, Nev.—No. 1, metamorphic shale, sandy; No. 2, arsenopyrite; No. 3, metamorphic shale; No. 4, quartzite; No. 5, galena with a little quartz; No. 6, garnet magnetite mass with traces of copper as chrysocolla; a contact rock; No. 7, rock, probably metamorphic shale, almost entirely decomposed, and filled with limonite after pyrite; No. 8, quartzite.

L. A. F., Virginia City, Montana.—No. 1, pebbly clayey soil, an alluvial deposit; No. 2, thoroughly decomposed rock, probably an andesite, now practically a clay soil; rock may have been acted upon by hot mineral water; No. 3, decomposed rock, similar to No. 2, but in a further stage of alteration; No. 4, garnet-magnetite sand, with some quartz and feldspar.

THE ROBINSON MINE.

Written for the MINING AND SCIENTIFIC PRESS
By J. B. PRITCHFORD.

The most productive gold mine in the world at the present time is the Robinson at Johannesburg, South Africa. It has paid $30,000,000 in dividends from a total production of 2,711,345 oz. of gold. It covers part of the main-reef series of veins, constituting a lode that has been traced for about 70 miles, with a dip that is steep at the outcrop, but flat in depth. Along the line of this lode there are about 80 mines being worked and supplying ore for 8500 stamps, crushing from 5 to 9 tons per stamp. The town of Johannesburg is near the centre of this district. The ore is a conglomerate consisting of pebbles bedded in a vitreous quartzite; the pebbles are egg-shaped, and vary in diameter up to 8 in. The Dutch term for the lode matter is 'banket,' and a child would recognize its resemblance to almond candy. The gold is fine; it lies in the matrix enclosing the pebbles, as well as in the pyrite; the ore can be designated as free milling, although the concentrate always requires treatment by chlorination or by cyanidation. The first discoveries of gold in the Transvaal were made in 1885. The country resembles New Mexico in appearance and cannot be considered suitable for farming. It was occupied by Boers who had trekked there from Cape Colony in 1836 because they were dissatisfied with the English methods of dealing with the natives. The land was chiefly used for grazing cattle and the country was so poor that the Government was practically bankrupt in 1877. After the discovery of gold in 1885 there was a large influx of English and other adventurers. Mining companies were organized and a large amount of European capital was brought into the country for mining purposes and numbers of the Boer farmers became rich from the sale of their farms. In course of time the newcomers outnumbered the Boers and demanded more say in legislative matters; they wanted this right without renouncing their allegiance to England, which claimed sovereignty. The Boers would not agree to this and the consequent friction culminated in a war that kept 300,000 British troops busy from October 1899 until 1902.

The Robinson mine is situated on the farm Langlaagte, upon which the first discovery of 'banket' was made by an employee of the Struben brothers in 1886. It adjoins Turffontein, the *mynpacht* (or mining right) of which is included in the Robinson property. Some of the ore was sent to Kimberley and was panned in the presence of several influential men of the diamond mines; among these was J. B. Robinson. Upon seeing the results of the panning, Robinson went to see the new discovery, and in July 1886 he purchased the Langlaagte estate for £7600 (about $35,000) and in September he purchased a half interest in the De Villiers *mynpacht*, now the Robinson mine, for £1100. Two months later he acquired the other half for £12,000. The Company's original capital was £50,000 in £1 shares. The present issued capital is £2,750,000 in £5 shares. The market price is now about £9. In 1891 Robinson retired from the board, which originally comprised A. Beit, H. Eckstein, J. B. Taylor, M. Marcus, and himself. When Gardner Williams, an American mining engineer, visited the Witwatersrand in 1887, very little development had been done on any of the mines, and at that time the Robinson mine was a hole in the ground about 50 ft. deep, full of water. It was not until 1890 that the mines of the Rand were developed below the oxidized zone, and at that time they did not have the appearance of persistence suggested by the pyritic quartzite that was found at greater depth.

In 1892 Thomas Mein, a California mining engineer, was appointed manager of the Robinson mine, and under his direction the mine was equipped and opened up in such a vigorous manner as not only to increase the dividends to the shareholders,

THE ROBINSON MINE RESULTS OF OPERATIONS FROM COMMENCEMENT UP TO JUNE 30, 1908.

Period.	Tons.	Stamps.	Yield. Fine oz.	Yield. Per ton. Dwt.	Working costs. Total. £	Working costs. Per ton. s. d.	Working profit. Total. £	Working profit. Per ton. s. d.	Dividends. £	Dividends. %
January, 1888, to Dec. 31.	7,486	10	22,345	59.70	21,661	57 10	69,438	185 6	.....	..
Year to Dec. 31, 1889.....	31,472	10-40	64,008	40.68	63,791	40 6	192,766	122 6	135,938	5
Year to Dec. 31, 1890.....	49,813	40	61,265	24.60	91,738	36 9	160,097	64 3	108,750	4
Year to Dec. 31, 1891.....	67,435	40-60	80,175	23.78	104,918	31 1	206,150	61 1	.....	..
Year to Dec. 31, 1892.....	113,188	60	123,531	21.83	207,129	36 7	275,771	48 8	326,250	12
Year to Dec. 31, 1893.....	94,842	60	113,282	23.89	168,680	35 6	310,284	65 5	108,750	4
Year to Dec. 31, 1894.....	107,935	60-70	124,019	22.98	212,823	39 5	312,887	57 11	383,750	14
Year to Dec. 31, 1895.....	140,655	70-120	134,098	19.07	199,647	28 4	366,296	52 1	385,000	14
Year to Dec. 31, 1896.....	177,500	120	146,091	16.46	256,512	28 10	378,480	42 7	330,000	12
Year to Dec. 31, 1897.....	180,400	120	151,605	16.81	244,382	27 1	403,852	44 9	412,500	15
Year to Dec. 31, 1898.....	184,000	120-140	161,353	17.54	228,503	24 10	469,621	51 0	440,000	16
Jan. 1 to Oct., 1899 (war).	165,444	140	144,991	17.53	189,584	22 11	438,200	52 11	220,000	8
May 1 to Dec. 31, 1901....	59,091	56	46,756	15.83	76,576	25 11	118,656	40 1	137,500	5
Year to Dec. 31, 1902.....	132,067	85	104,504	15.83	164,148	24 10	275,018	41 7	371,250	13½
Year to Dec. 31, 1903.....	209,933	128	144,462	13.76	243,368	23 2	364,541	34 8	302,500	11
Year to Dec. 31, 1904.....	274,457	170	170,595	12.43	311,174	22 8	407,440	29 8	385,000	14
Year to Dec. 31, 1905.....	328,230	200	217,011	13.22	370,770	22 7	542,534	33 0	467,500	17
Year to Dec. 31, 1906.....	362,367	210	243,716	13.45	394,858	21 9	632,382	34 10	550,000	20
Year to Dec. 31, 1907.....	410,927	210	303,801	14.79	372,928	18 1	904,270	44 0	660,000	24
*Half-year, June 30, 1908	247,230	210	153,737	12.44	169,445	†13 8	483,584	39 11	412,500	15
Totals and averages..	3,344,472		2,711,345	16.21	£4,092,635	24 5	£7,312,267	43 8	£6,137,188	..

*Compiled from Monthly Returns. Provincial figures only.
†In May and June 12s. 4d. and 12s. 8d. per ton, respectively.

but to assure a successful future. From 1896 to 1903 the mine was under the management of H. B. Price, who continued the good work except during the interruption of the war period, which commenced in October 1899. When the war began the mines were operated by the Boers for the benefit of their own government. Those mines having a preponderance of non-British shareholders were worked by the company's staff; others, like the Robinson, were managed by the Government. The State mining engineer took control of the Robinson, which had filled with water to the twelfth level, the mill was run to produce gold for the Boer Government, the foundry and machine-shops were used for other mines, and a government refinery was conducted under the management of Mr. William Bettel. The best mines were thus worked to produce the sinews of war for the Boers and the last gold shipment to England was captured at Elandsfontein on the day war was declared, the mail and express car being uncoupled from the Cape Town train and sent to Pretoria with its gold bars. After Lord Roberts entered Johannesburg all work was suspended on the mines until May 4, 1901, when the Meyer & Charlton mill started 50 stamps. On May 6 the Robinson and Treasury mines started their mills. It had been the intention of some of the Boer officials to destroy the mines before Lord Roberts entered Johannesburg; holes had been drilled in 25 shafts and 40 holes had been drilled in the main shaft of the Robinson mine from a depth of 5 ft. to 500 ft. down for the purpose of blowing up the shaft. But good sense prevailed and this scheme was not carried out, although at a later period of the war the works of the New Kleinfontein were destroyed by the Boers.

In 1903 William M. Mein, a son of Thomas Mein, was appointed to the management of the Robinson mine. He graduated from the University of California, having had a previous metallurgical training. By reference to the tabulated statement of operations it will be noted that the gold output and the decrease in the working expenses has proceeded regularly under Mr. Mein's management, and he has since been promoted to the head of the central administration of a number of important mines; his former position in the Robinson is now being filled by R. C. Warriner, who has had a large experience on the Rand.

The Robinson mine is within a mile of the centre of the town of Johannesburg. There are two shafts, one inclined about 40° and one vertical. The development of the orebodies has been completed to the boundaries of the adjoining properties, in depth as well as strike. The law of the Transvaal gives rights limited by the surface boundaries continued vertically downward; no apex right is recognized. The owner is not allowed to work nearer than within 30 ft. of his boundaries except by permission of the State mining engineer; and this permission is not given except by agreement with the owner of the adjoining ground. The surface plant includes two shaft head-frames with bins and sorting appliances, mechanical haulage to convey ore to the 210 stamps, air-compressors of about 200 drills capacity, electric light and power plant, four tube-mills, a cyanide plant having steel vats 50 ft. diam., a compound to accommodate 2500 Kaffirs giving a minimum of 250 cu. ft. of air space for each man and fitted with angle-iron bunks and removable boards, a hospital, houses for married employees fitted with bath and other modern conveniences. There is a recreation hall, billiard-room, reading-room, and boarding-house for the employees, and there is a resident physician on the property.

Notwithstanding all the interruptions of the war and subsequent labor troubles, the mines have been managed so that unnecessary friction has been avoided and the shareholders have reaped the benefit due to the harmonious co-operation of the workers and a well organized staff under intelligent direction, without which the desired results cannot be accomplished. As there have been a number of American mining engineers engaged on the Rand, it may be interesting to mention some of the events in which they took part.

There was considerable dissatisfaction among the Uitlanders on account of their not having sufficient representation in the Government of the Transvaal and, considering that the mining industry paid over 90% of the taxes, they thought that they were entitled to representation in the Volksraad. The time formerly required for naturalization had been extended by the Boers, and some of the English wanted to vote without severing their allegiance from England on the plea that Great Britain was the suzerain power in the Transvaal. The gold tax on the net output at this time was 5%. A dynamite monopoly working under a Government concession was charging 50% more for explosives than is charged at the present time, and $5,000,000 per annum was being paid for this item alone. The Netherlands railroad was another semi-government concession that charged all the traffic would bear, and Oregon pine costing $14 to $16 per thousand feet at Puget Sound would cost $75 to $80 per thousand delivered at Johannesburg. These exactions tended to foment trouble; after considerable agitation a reform committee was organized, and Capt. Thomas Mein was elected chairman. The committee invited representative men to interview President Kruger with a view to making some adjustment of the differences existing between the Boers and the Uitlanders. The men selected were Charles Leonard, Lionel Phillips, Francis Rhodes, and John Hays Hammond, the last being then consulting engineer to the Consolidated Gold Fields of South Africa. While the question of organization was being discussed by the reform leaders, Dr. Leander S. Jameson made a reckless dash for Johannesburg without the sanction of the reform committee. The result was that Jameson and his 500 men were defeated and captured by the Boers after a running fight from near Krugersdorp through Randfontein to Doornkop, and on January 1, 1896, they were brought into Johannesburg as prisoners of war. The complicated controversial events that led up to the raid and Cecil Rhodes' alleged connection with Dr. Jameson are regarded from different standpoints by English and

Dutch. Shortly after the raid there was a terrific explosion of several cars of dynamite on the railroad at Fordsburg near the Robinson mine. Dozens of people were killed and injured and a large number of dwellings were entirely demolished. The killed and injured were chiefly among the poorer class of Boers and others residing near Fordsburg. The mining companies started a subscription to alleviate the sufferings of the injured, and in about 24 hours nearly $200,000 had been subscribed, making a record not equaled for liberality in the civilized world, clearly showing that there were some broad-minded people in Johannesburg. Since the English have been in power the railroad rates under Government management have been lowered about 40% and outside competition is allowed, but the gold tax has been increased from 5 to 10%, presumably to pay the war debt. Owing to the shortage of Kaffirs at the close of the war, the experiment of importing Chinese was tried. They were engaged for three years with their passage paid both ways, and proper arrangements were made for feeding and housing them. They proved efficient laborers, but English sentiment was opposed to time-contract labor, and termed it a form of slavery. There was also some racial prejudice on the part of the Boers. So at the expiration of their time the Chinese are being sent back. The black natives are the natural laborers of the country, and of course are entitled to the opportunity to work on the mines, where they can better their conditions. In their kraals the natives are scantily clad and they have little else but cornmeal to eat. On the mines they are well fed and housed in a sanitary manner.

There is no mining centre where the enterprise of capitalists has done as much for the advancement of the mining industry and for the comfort of employees as at Johannesburg. At the present time the Chamber of Mines is offering a prize of $25,000 for the best rock-drill for stoping, and this is open to the world until the end of December. Some of the mines require an expenditure of from $3,000,000 to $10,000,000 for development and equipment and four years' time before they can be put on a paying basis. Capital is still being subscribed for this kind of work, notwithstanding the obstructions put in the way by politicians who send labor agitators and emissaries to stir up trouble; moreover, uninformed religious fanatics 6000 miles away want to dictate to mine managers, who are familiar with the situation, and tell them how they should deal with the native black man at Boria Boola Jar. Others, especially legislators who do not realize that the mines are the main support of South Africa, are inclined to create obstacles, which intimidate the capital that would otherwise be invested for the purpose of developing the millions of tons of low-grade ore that cannot possibly be worked except under the most favorable conditions.

Accompanying this historical sketch there is a tabular report showing the results of operations on the Robinson mine, showing a gross production to date of £7,312,267.

CENTRIFUGAL DRY CONCENTRATOR.

*At a recent meeting of the Société d'Encouragement, a centrifugal separator for the dry concentration of ores, improved by M. Souchon, was described by M. Lavauden. This apparatus seems to have left the experimental stage. It is employed at the La Fare copper mines, Oisans, and the interesting results obtained have led the El Cid Mining Co. to apply it on an extensive scale in their works at Ezcaray, Spain. In the dry process, the difference in acceleration acquired by the various particles, projected with great velocity in a resisting medium, which here is atmospheric air, is brought into play. Crushing for dry treatment should be finer than for washing, and it seems that a maximum diameter of 2 mm. can hardly be exceeded. The crushed ore is conveyed directly to the centrifugal separator. It consists of a cast-iron frame, inside which is a vertical electric motor. There is a circular plate on the induced-coil shaft, and in the centre of this plate there are a number of flanges, while on its circumference there are grooves of a special form, like the flanges, according to the nature of the ore. The plate is covered with a cap with an orifice in its centre, through which the material to be treated passes. This cap drives the material into the grooves and prevents it acquiring an ascensional movement from the great rotary velocity. The motor is governed by two rheostats, mounted so as to assure an exceedingly precise regulation of speed. This is a necessary condition, as the curve of projection of the material, that is, the distance which each particle travels before it falls to the ground, is determined by the combination of the velocity and the weight. The speed of working must be determined by experiment according to the nature of the ore. In treating grains 2 mm. diam. at most, with a speed of 800 to 1200 r. p. m., the maximum trajectory is less than 10 mm. Each concentric zone will contain particles of the same weight, so that a final separation has still to be made. This separation is easily reached by screening to obtain the grain of each particular zone. In principle the smallest grain of quartz deposited should be larger than the biggest grain of ore fallen in the same zone, otherwise screening will not be effective. Practically separation is not as exact as theory calls for, as the rotary motion of the separator causes eddies in the air. There is also the interference between particles. The mineral projected by the separator is automatically collected from each concentric zone and conveyed to the corresponding screen. This collector is a central cast-iron column on which the separator is bolted. On this column there is a boss into which sixteen wooden arms are fitted, carrying scrapers. The ore thus collected falls through openings in the corresponding zone, whence it is conveyed through special ducts to suitable screens. The degree of enrichment obtained by the process varies. In treating crude ore of 0.54% it can be raised to a percentage of 2.5%, and even 10% by a second separation.

*Abstracted from translation in the *W. A. Mining, Building, and Engineering Journal*, July 30, 1908.

CHLORINATION IN CALIFORNIA.

Written for the MINING AND SCIENTIFIC PRESS
By WILTON E. DARROW.

The Plattner system of chlorination was first introduced into California at Grass Valley by G. F. Deetken in 1857. The process is said to have been successful from the start, but many of the earlier tailing dumps assayed as high as $75 per ton, and were subsequently purchased, and shipped to the smelters at San Francisco for final treatment. Previous to the introduction of the Plattner chlorination process, the only method employed for the recovery of the gold associated with the sulphide-concentrate obtained in the gold-mills, was to grind and amalgamate them, in various appliances such as arrastres, pans, and Chilean mills. As only a small part of the gold associated with the sulphides in concentrate can be recovered by such a crude method, any process that would yield a 75% recovery, would have been considered successful. The process rapidly came into general use throughout the gold mining districts of the State, and it was the chief one used for more than 25 years. Unfortunately, it was introduced as a manual process, using hand-reverberatory furnaces for desulphurizing the ore, and excessive quantities of salt were added in the furnaces for giving a chloridizing roast. For many years 5% of salt was the quantity generally used, resulting in excessive volatilization, and in losses through slagging.

At that time in Nevada and Arizona many tons of rich silver ores were being treated by roasting with salt, followed by pan-amalgamation. As it was necessary to use large quantities of salt in the furnaces to chloridize the silver, the men in charge of gold-chlorination plants probably thought that their ores also needed salting. Of one thing they were certain; namely, that the gold dissolved easier afterward, and the generation of chlorine gas from chemicals was both disagreeable and expensive. This was also a period when nearly all working metallurgists were in possession of profound 'trade-secrets,' transmitted only in whispers to favored disciples; to men who could be trusted to keep in the straight and narrow rut. In other parts of the world where there were larger quantities of sulphide ores amenable to the process, mechanical furnaces and barrel-chlorination plants were installed, and greatly reduced the working expenses, and increased the extraction of the gold. In California the metallurgists kept wallowing along in the old Silurian rut, until awakened with a jar, to find the smelters absorbing all the available concentrate.

From a careful study of the Plattner process, as formerly practiced in California, it appears that there were losses, some due to mechanical defects in appliances used, others due to ignorance or carelessness on the part of those in charge of the work. One cause of loss is that some of the ore passes through the reverberatory furnace without being thoroughly oxidized. This occasions a loss from the excessive consumption of chlorine during the charging of the vats with gas; and a second and greater loss in the subsequent leaching of the ore, by the formation of precipitants that mingle with the gold-chloride solution, and precipitate some of the gold, leaving it in the tailing. This unoxidized ore is sometimes due to improper roasting, but even with careful attention some ore will pass through a reverberatory furnace in the form of lumps. Some of the lumps are due to argillaceous gangue material, associated with the concentrate, due to imperfect work at the gold-mills, while others are caused by partial oxidization and agglomeration of some of the concentrate. This is particularly noticeable when roasting concentrate that has been stored for several months in a moist condition. Even fine dry salt if charged into a furnace with damp ore will help to bind some of the concentrate into lumps that will pass through the furnace without being broken up and oxidized. Moist or lumpy salt charged into any part of a furnace will form salt-balls, that pass through the furnace encased in a shell of imperfectly roasted ore. To obviate these difficulties it is evident that both the ore and the salt should be dry and pulverized before being charged into the furnace.

Heavy losses are occasioned by the fusion of some of the ore in the furnaces, when applying the finishing heat for the decomposition of the sulphates. When sulphide ores are giving off the first atom of sulphur a high temperature is evolved, which, if slightly augmented by the addition of external heat, will suffice to produce incipient fusion on the exposed surface ore-mass, locking up the contained gold in an impervious slag. Again, when 'dead-roasted' ore combined with salt is heated to a certain temperature, there seems to be a reaction whereby a ferro-silicate of soda slag is formed, effectually locking up some of the contained gold, while the liberated chlorine combines with other atoms of gold and passes off as a volatile chloride. I have made many tests on volatilization-losses, and have never detected them in other parts of a furnace, or found them to occur when sulphates were still present in the charge. For this reason I made a practice of having the finishing heat applied before the sulphates had all been broken up, so that the finished charge when spread on the cooling-floor would still give off a slight odor of sulphur. My later practice, however, has been to nearly dispense with the use of salt in the furnace, obtaining a much higher extraction thereby, but requiring more chemicals to chloridize the ore.

Most of the concentrate obtained from the California gold ores contained some basic elements that may be converted into sulphates by adding a small quantity of sulphuric acid to the water with which the roasted ore is dampened before being charged into the vats, thus rendering them inert to the action of chlorine-gas. In my practice I have found that the addition of about 0.75% of the acid is beneficial in preventing an excessive consumption of chlorine-gas, but the addition of any acid in excess of the quantity necessary to satisfy the bases does not reduce the consumption of chlorine, although it has a marked effect in reducing the percentage of extraction of the gold. The addition of 2 or 3% of acid almost completely prevents the extraction of

any gold. When ferrous-sulphate is used to precipitate the gold from solution, the reaction is rapidly completed as soon as a sufficient quantity of the precipitant has been combined with the solution, but the resulting precipitate is in so fine a state of sub-division that a long time is required for the solution to settle clear. I have found that even after standing 48 hr. before being siphoned off, the waste solutions still contain fine precipitate to the value of about $1.80 per ton of solution. This was formerly allowed to run to waste at many of the plants in California, and represented about $2 per ton on the ore treated.

A hand-rabbled reverberatory furnace is totally unsuited for the purpose of desulphurizing ores, for the reason that it is commercially impracticable to employ a sufficient force of men to rabble the ore often enough to prevent some of it from becoming over-heated when applying the finishing fire to the sulphate charge. In Colorado a rotary-hearth furnace is giving excellent results, overcoming the difficulty above referred to. The distinctive feature of this furnace is that, as the fire-boxes and rabbles are stationary, while the hearth is constantly rotating, there is no chance for the ore to remain where it receives so high a heat as to fuse it.

A few years ago at the Mount Morgan mine in Queensland a large barrel chlorination plant was discarded in favor of an open-tank leaching process. In this process the chlorine gas is absorbed in water, forming a weak solution that does not give off chlorine when exposed to the air. The leaching is done in large asphalt-lined concrete vats, from which the spent tailing is discharged by steam-shovels. It is said to be the cheapest and best of the chlorination processes. I made a number of tests on California roasted ore and tailing, with this process, and obtained excellent extraction with fuming saturated solutions, while weak solutions, such as are used at Mount Morgan, dissolved but little of the gold. Several years ago an article was published in the MINING AND SCIENTIFIC PRESS descriptive of a Plattner chlorination plant in Australia. The writer stated that if a sample of roasted ore was saturated with gold-chloride solution, some of the gold would be precipitated in the ore in an insoluble form, and could not be extracted by subsequent 'gassing' and leaching, although another sample of the same ore that had not been saturated with the gold chloride would give up its gold readily. I have made tests and find that the statement is correct. For this reason I believe it would be better to destroy these precipitants previously with chlorine gas before commencing to circulate chlorine water through the ore, which would immediately become charged with gold, and, coming in contact with bases, would leave some of it in the tailing.

In a modern chlorination plant the old wooden vats should be replaced by asphalt, or lead-lined concrete vats. These should be built with slightly conical bottoms, and a centre discharge for solutions and tailing. Wooden filter-bottoms are a nuisance, and should be avoided. A good filter may be constructed of perforated stoneware and coarse sand. Wooden covers may be employed, and these should fit into water-sealing grooves in the top of the vat. The chlorine gas should be generated electrolytically from common salt, and could be charged directly into the ore-charged vats as fast as needed, while at other times it could be sent to a scrubbing tower, and formed into a saturated solution for leaching the ore in the vats after they had been first saturated with gas. Any gas displaced from the vats by the leaching solutions could also be sent either to other ore-filled vats, or to the scrubbing tower, thus converting what is generally a nuisance around the Plattner plants into a valuable reagent for the recovery of gold. I think the excess of free gas could also be recovered cheaply from the gold-chloride solutions before precipitating the contained gold. Water absorbs a maximum quantity of chlorine at a temperature of about 50° F., and gives it all up at 212°. If the solutions were heated in a closed receptacle to a temperature of about 100° F., the boiling point could be lowered by means of an exhaust fan sucking out the chlorine gas as fast as it escaped from the solution, and forcing it either into a vat of ore, or else to the tower for making up solutions. Where gold has been precipitated in a Plattner chlorination vat from the precipitating action of unchloridized sulphates a wash with a saturated solution of chlorine water is effective in dissolving and recovering it. Therefore I think it should be used as an adjunct to the Plattner process. In an up-to-date plant all ore and solutions would be handled mechanically, making it cheaper than the present barrel process, usually estimated to cost about $3 per ton of ore.

The Greenawalt process, applied in Colorado and Nevada, offers some exceptionally interesting innovations that may be useful in treating California products. Briefly stated, it consists in roasting the ore in a mechanically rabbled muffle-furnace, using a heated air-blast which is introduced under the furnace-hearth. The roasted ore is cooled, charged into leaching-vats, and leached with a saline chlorine-solution, forming by taking up electrically generated chlorine-gas in a scrubbing-tower with a saturated solution of salt water. The solution has the power of dissolving silver, lead, and copper, as well as gold. The solution is then precipitated electrolytically on lead shavings for the recovery of the gold; after which the solution is electrolyzed, re-generating the chlorine for future use, and recovering the other metals.

Since the discovery of diamonds in a peridotite dike in Pike county, Arkansas, energetic search has been made for additional occurrences of this igneous rock. The result has been to reveal another outcrop 2½ miles distant from the first-known locality. No diamonds have as yet been found in the second outcrop of peridotite. These igneous masses are evidently the upper portions of a great magma which in a few places has lifted cretaceous strata into domes, and less frequently has penetrated them. Such disturbances, in which, however, the underlying magma did not reach the surface, are common over a large area in Arkansas, and are found even as far south as central Louisiana.

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EDITORIAL.

SMELTING OPERATIONS at Ely are fairly under way. In October the Steptoe Valley concentrator and smelter produced 2,000,000 pounds of copper. The concentrator has two complete units engaged, with a combined capacity of 3200 tons per day; a third unit will be completed within six weeks, and work on a fourth unit has been commenced. The smelter has a capacity of 3,000,000 pounds per month and the plant is eventually to be increased so that it will produce 5,000,000 pounds of metallic copper. The concentration is in the ratio of 7 to 1 and the ore is averaging 3 to 3¼ per cent copper.

FROM THE published accounts of the annual meeting of the Camp Bird Company we note that Mr. J. E. Spurr was engaged to make a special investigation of geological conditions with a view to giving advice concerning future explorations. It appears that he is opposed to further development work in depth and recommends lateral exploration instead. What knowledge we have of the locality is such as to confirm the correctness of this suggestion, and we congratulate Mr. Spurr on the courage required to give advice usually deemed unpalatable by mine operators. The geologist or engineer who suggests further development in depth can at least be assured that his recommendation will be acceptable to the management and that it will not be proved incorrect for several years, if at all, for 'depth' is a beautifully vague limit, which, like the feasts of the Church, can be moved. Lateral development is much cheaper than shaft sinking and in a region traversed by a complex system of vein-fractures it is more likely to lead to the discovery of ore.

WITH PLEASURE we learn that Mr. Henry A. Miers, professor of mineralogy in Oxford University, has been appointed principal of the London University. His book on mineralogy is known to students and his personality, we are told, is as attractive as that volume. Possessed of energy and initiative rare in "the home of lost causes," Professor Miers is also an effective lecturer and a good administrator. Service on numerous committees of organization for technical institutions in many parts of the world has given him an experience that should prove useful now. Born in Brazil, instructed at Eton, educated at Oxford, and a traveler to many regions, he is a man of broad sympathies. Among his travels may be mentioned those to South Africa, British Columbia, and the Yukon, as likely to give him an understanding of mining affairs. He is old enough to have poise and young enough to retain enthusiasm. We welcome his appointment to the head of the University of London because the Royal School of Mines is now tied to that educational institution.

With such a Principal, the old R. S. M. ought to do well.

CHAFEY is the latest of the old mining camps of Nevada to be revived by the breath of up-to-date industry. Under 'Special Correspondence' we publish an interesting letter from a correspondent, Mr. Aubrey L. Wisker, who writes both carefully and well. We wish good luck to this new-old district.

SPELLING REFORM suffers more from its friends than its enemies. In a letter sent out from the Smithsonian Institution by Messrs. R. S. Woodward and L. O. Howard, it is stated that the American Association for the Advancement of Science has become a clearing house for the scientific activities of America and offers membership without entrance fee to those who are members of certain technical societies. With that we do not quarrel, but then we note that a letter signed by two scientific men of prominence under the auspices of the Smithsonian Institution and the American Association contains such mongrel spelling as *thru* for 'through' and *cheque* for 'check'. We have received a protest from a member of the American Institute to whom one of the circular letters was addressed. We are in accord with him. *Thru* is the 'funnetic' spelling, while *cheque* is antiquated. Anyone adopting *thru* while retaining *cheque* shows himself the victim of a fad, not the intelligent supporter of a scientific departure.

WE NOTE with pleasure that the premier mine of America, the Homestake, continues to be profitably productive. An abstract of the report for the fiscal year ending on June 1, 1908, appears on another page. The mills treated 1,450,900 tons yielding $4,717,746, or $3.25 per ton. Operations were affected by the fire that stopped the extraction of ore during a portion of 1907 and, as far as we can deduce from the statement of accounts, the profit for the period under review was $1,107,282. A dividend of $546,000 was distributed. The report is not conventional in form, but it scarcely calls for comment, as the mine is controlled by Mr. James B. Haggin and the representatives of the estate of his deceased partner, George Hearst. It is to the Homestake that the University of California owes, at least in part, the munificence of Mrs. Phoebe Hearst, the widow of the man who was closely connected with the early development of this great mine. No particular mention is made in the report concerning the new cyanide annex. It is generally understood that this plant, designed by C. W. Merrill, the consulting metallurgist to the Homestake Mining Company, has proved a notable success, and that approximately one-half the profits are due to the extra gold saved after the stamp-mills have done their best.

FEAR that an increased production of cheap copper to come from the big mines at Ely, in Nevada, and Bingham, in Utah, would tend to depress the market price of copper should be lessened by the recognition of the fact that new producers are not numerous. Although 25-cent copper, while the price lasted, did greatly stimulate the search for new mines all over the world, it is noteworthy that on the American continent only the Miami and the Ray appear to have been added to the list of those likely to be heavy producers. The Cerro de Pasco, concerning which we publish a valuable article by Mr. Lester Strauss, was started before the copper boom, and the bonanza deposits of the Copper River, in Alaska, were known before high prices spurred prospectors to feverish seeking for new deposits. While the 8 and 9-cent copper of the 'disseminated in porphyry' type at Bingham and Ely will furnish a large production, it is reasonable to expect that it will be absorbed by domestic consumers in case of any such industrial revival as is confidently expected. Use of copper in the electrification of railroads is sure to be a big factor in creating a market for the metal, and the chief obstacle to such an employment of copper would be an abnormal price. A 14 to 17-cent quotation is more likely to aid the best interests of mining than the 20 to 25-cent price prevailing in the early part of 1907.

Votes Lost.

Election day is over, and the returns indicate that most of us are pleased with the result. All of us are glad that the dust-storm of political activity is past. It is too early to make general deductions, but we shall hope to do so when an accurate analysis of the vote has been made. In the meantime there is one aspect of the election that invites immediate comment. We refer to the large number of professional and business men practically disfranchised by the necessities of their avocations, whereby they were compelled to be absent from home on election day. Among these it is fair to say were some of the most intelligent citizens of the country. For instance, the number of passengers carried on the railroads of the United States during 1907 was 860,648,574, and the passengers traveled an average of 32.72 miles. While the population is 84 millions, the voters total 14 millions, so that only 1 in 6 of the population is a political unit. The average number traveling on a single day is 2,350,000, and of these more than 1 in 6 would be voters, because women and children travel less than men, but fully one-half the passengers would be making short journeys such as would not interfere with their electoral privilege, so that, on a rough estimate, we infer that 400,000 men lost their vote. Some of these failed to register, not expecting to be at home on election day. But even a smaller number—say, 250,000—is enough to be an important factor in some elections, either State or National. Apart from the loss to either party of a large number of votes, there is the denial to the individual of his privilege as a citizen. Some men travel on election day from choice, but the majority are under orders from their employers or else they are moving in the performance of industrial functions. There is a remedy. Identification by signature is recognized in business affairs; in the elections of societies and associations, voting by mail is deemed safe and proper. Why not adopt a letter ballot with a perforated slip wide enough for a signature, somewhat

after the style of a bank check? The Congress should enact a law by which a properly registered voter, compelled to be away from his precinct on election day, could vote by mail. Among those entitled to the right, but losing it by the discharge of duty, are railroad and steamship employees, commercial travelers, and professional men—especially those nomads, the mining engineers.

State Mining Bureau.

In our issue of February 8 we criticised the administration of the Mining Bureau and explained how it was prostituted to political service. We said little concerning the State Mineralogist, who is the chief of the Bureau, for we regard him as an accidental and ephemeral feature in the political corruption of California. At that time we protested against the summary dismissal of Mr. Charles G. Yale, who as statistician had for many years given the Bureau a dignity it otherwise wholly lacked. The resignation of three of the trustees—Messrs. Curtis H. Lindley, F. W. Bradley, and E. A. Stent—was recorded, and the hope was expressed that the two remaining trustees, Messrs. Louis Janin and Harold T. Power, would refuse to lend themselves further to the farce enacted in the Ferry building. Shortly afterward we were informed authoritatively that steps had been taken to invite Mr. Yale to resume his duties, and that our silence on the subject would facilitate an adjustment of the difficulty. We learn now that Mr. Aubury tricked Mr. Yale into an impossible position, and the net result is that the Mining Bureau has been made even more ridiculous than usual, for the newspaper reporter who replaced Mr. Yale as statistician has collaborated with Mr. Aubury in publishing statistics that are infantile in their incorrectness. According to the Bureau, a gain of nearly $9,000,000 was made by California in the value of the output of 1907 as compared with 1906. This would be gratifying were it even approximately correct, which it is not. Fortunately, the experts of the Geological Survey furnish figures for comparison; these are available in the 'separates' or advance chapters of the annual report of the Division of Mineral Resources already to hand. While recognizing that statistics are necessarily subject to error, because of the difficulty of compilation, and that even the Survey has published statements open to criticism, nevertheless, we know that the specialists employed by the Government are, in the main, both careful and competent, while, on the contrary, we know that Mr. Aubury and his present arithmetician are both careless and incompetent; therefore we presume that any glaring discrepancies between the two sets of figures are properly to be imputed to the incompetence of the newspaper reporter placed by Mr. Aubury in the position filled so long and so faithfully by Mr. Yale, a man of national reputation in the domain of mineral statistics. But there is other evidence of error, besides the deadly parallel with the Survey's reports. For instance, the Bureau gives 164 tons, valued at $16,690, as the output of lead, while it is a fact that one company in the county of Inyo smelted ore from which 1068 tons of lead was obtained. Although there is so little coal mining in California, the Mineralogist was unable to make a good guess as to the production. He says the State produced 23,734 tons, worth $55,849, while the Survey shows that only 13,590 tons, valued at $38,213, were mined. The representatives of the Survey visited the coal mines while the Mineralogist was engaged in preparing self-laudatory articles for the daily press. He guessed the output of gems to be worth $232,642, when it was $165,010. He found that 82,270 tons of pyrites had been mined, while the Survey returns show only 51,950 tons, with a proportionate difference in total value. He finds 300 ounces of platinum worth $20.84 per ounce, when there was not much over 100 ounces, which sold at $15.50 per ounce. The highest price paid was $17 and the lowest $14 per ounce. The Bureau credits California with only one ton of manganese, worth $25 per ton, while the Survey returns 100 tons, valued at $6 per ton. In mineral water, the Bureau gives nearly 3,000,000 gallons, valued at $544,016, but the Survey shows only 1,680,169 gallons were produced, with a valuation of $460,972. The basis of valuation must have been wrong in one of these estimates. In copper, the Mineralogist has blundered to the extent of about 4,000,000 pounds in quantity and $600,000 in value. He credits Shasta county with 27,844,364 pounds, while there is good reason to believe that the output was less than 23,500,000. He probably got his smelter and refinery figures mixed with the mine returns. This is a common blunder of amateur statisticians. Moreover, the Mineralogist is short over 400,000 pounds in the Calaveras output, and in his tabulated statement he says that the output of Kern, Humboldt, and Mariposa counties may be found among the 'unapportioned', but he gives no unapportioned figures for copper. He appears to have adopted the smelter returns of California copper as given by Mr. L. C. Graton of the Survey; these are much larger than the mine returns, but the Mineralogist did not know the difference. In other substances the discrepancies are no less striking; thus the Bureau puts the granite output at $373,376, while the Survey has $1,306,324. The Survey values the limestone (not burned into lime) at $177,332, and the Bureau places it at $406,041. The Survey has a valuation of $1,029,749 for trap-rock in 1907, but the Bureau makes no mention of this product, although it probably figures as 'macadam'. The Survey's total for granite, trap-rock, sandstone, marble, and limestone is $2,254,026, while the Bureau gives the combined value of the granite, limestone, macadam, marble, paving blocks, rubble, and sandstone at $3,159,995. It is not necessary to go into further details. Enough has been said to prove the absurdity of these so-called 'statistics' of the State Mining Bureau.

The statistical sheet giving to the world the proof of the maladministration of the Mining Bureau is the only publication issued by that office for more than a year, notwithstanding the employment of several persons supposed to be engaged in useful labor. While the Mineralogist is not expected to

originate anything of technical or scientific value, having had no training for such work, it is supposed that he would engage people who could do something of the kind. He did attempt to collect the gold and silver statistics for the past year, but failed to do so, and was finally compelled to take the data prepared by the resident official of the Geological Survey. In spite of this fact, Mr. Aubury failed to credit either the Survey or its representative for the figures used. Until a man of character occupies the office of State Mineralogist it is a waste of the State's money and a slur on the State's reputation to attempt the compilation of statistical information.

The Mining Bureau as now conducted is a gross impertinence; it is subject to the management of a nondescript assayer who is the henchman of a political boss of the railroad company that has debauched the public life of California for the time of a generation. There is a Board of Trustees, but the members of it serve merely as an auditing committee giving their sanction to the money expended by the Mineralogist. We call upon the trustees—Messrs. Louis Janin, Harold T. Power, Frank Griffin, A. H. Ward, and C. T. Deane—to stop the farce in which they are playing a discreditable part. They know the meaning of the performance. It is their duty to the State to separate themselves from the Bureau and to protest against the stultification of the mining industry. At present they act as an auditing committee, with no real power to discipline or improve the work of the Bureau. By remaining in office they condone the degradation of a State institution; by resigning and using their influence in the community and before the Legislature, they can hope to do some good.

If the Bureau is to continue to be an appanage of the Southern Pacific, let it be abolished. It serves no useful purpose now. The museum and the library might be placed in charge of the University.

At this juncture we are reminded that there is a California Miners Association. It is moribund; it has failed to meet since 1906; even the executive committee has not been called in session for nearly a year. Here is a live issue. The Association could do nothing better than devote itself to the re-organization of the Mining Bureau. Let the public opinion of the State be aroused with a view to bringing such pressure on the Legislature, when it convenes early next year, that legislation may be enacted either mending or ending the Mining Bureau. The State Mineralogist should be appointed, not by the Governor, who is usually a political puppet, but by a Board of Trustees, chosen on non-political grounds by representative organizations such as the Faculty of the University, the Miners Association, the Chamber of Commerce, and the like. The Board, once selected, should be self-perpetuating, after the manner of the Public Service Commission in New York, and the man chosen by them for State Mineralogist should hold the appointment for life, or as long as he remained competent. If a reasonable salary be paid and a proper appropriation set aside for the service of the Bureau, it could be made worthy of the great mineral industry of the State of California. At present it is a pitiful absurdity.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

T. Lane Carter is here.

William A. Farish is at El Paso.

F. W. Baker is expected at New York.

A. Chester Beatty is in New Mexico.

Henry Brelich is on his way to Manchuria.

F. F. Sharpless has gone to London from New York.

O. B. Perry has returned from Dawson to New York.

Edmund Jussen has returned from Nevada to Spokane.

W. L. Leland has arrived in San Francisco from Nome.

Rene Proust is at Kuala Lumpur, in the Malay Peninsula.

Charles W. Goodale has returned to Butte from New York.

Chester A. Thomas has returned to Santa Barbara from Dawson.

Frank Oldfield is visiting San Francisco from Los Angeles.

Thomas Cox will be returning from Cerro de Pasco in February.

T. R. Drummond is manager of the Cactus mine, at Newhouse, Utah.

Thomas G. Davey has an office at 210 Finsbury Pavement House, London.

John C. F. Randolph has returned to New York from a visit to England.

Carl Henrich is manager for the Mineral Development Co., at Guanajuato.

George L. Sheldon, of Denver, is operating at Badirguato, in Sinaloa, Mexico.

L. I. Ogden has returned from Korea to his home at East Auburn, California.

W. F. Harris is manager for the Inde Gold Mining Co., in Durango, Mexico.

Hugh R. Van Wagenen is in San Francisco on his return from Valdez, Alaska.

E. W. Parker, of the Geological Survey, is investigating the coal mines of California.

Thomas J. Rickard has been appointed assayer at the St. David's gold mine, in North Wales.

Henry F. Lefévre has been examining the Big Halstead mine, in Plumas county, California.

J. M. Mowbray has returned to London from a visit to the lead mining districts of Missouri.

Alexander Leggat has returned to Butte from a two months surveying trip in eastern Montana.

Charles W. Abbott is at Ely, Nevada, having resigned a position on the Daisy mine, Goldfield.

James Moffet, of Oakland, California, has gone to Colima, Mexico, to examine deposits of iron ore.

W. F. Ferrier has been appointed mining geologist to the United States Smelting, Refining & Mining Company.

Charles M. Becker resigns as manager of the Stratton's Independence mine, Cripple Creek, on December 1.

C. D. Grove has taken charge of the Skagit Queen Con. Mining Co.'s operations at Marblemount, Washington.

C. W. Purington writes from the Ochotsk district, in Eastern Siberia, but he expects to be in London shortly.

John A. Reid has gone to Phoenix, Arizona, to recuperate from an attack of malaria, contracted in Lower California.

F. G. Clapp is spending the greater part of the fall examining oil and gas lands in Pennsylvania and West Virginia.

Pellew Harvey & Fell have been appointed consulting engineers to the Cobar Gold Mines, Ltd., in New South Wales.

H. S. Mulliken, superintendent of the Peñoles smelter, at Mapimi, Durango, Mexico, is spending a vacation at Los Angeles.

T. T. Barnard, connected with the Pacific American Mines Co., will soon go from Gold Hill, Ore., to Metaline, Washington.

George E. Howard, general manager for the Sahuayacan Mining Co., at Ocampo, Chihuahua, has returned from Pittsburg.

James J. Hollister has been appointed assistant general manager for the Hinds Con. Mining Co., at Santa Barbara, Chihuahua.

Walter L. Brown, who was recently in charge of cyanidation experiments at the Alaska-Treadwell mine, has gone to South Africa.

Ernest A. Haggott, of Los Angeles, has returned from Alamos, Sonora, where he is directing work at the Santo Domingo mine.

T. M. Gibson has resigned as local manager for the Wild Goose Mining & Trading Co. at Nome and will operate on his own account.

C. M. Eye, superintendent of the Benguet Consolidated at Baguio, P. I., is visiting points of interest along the China coast and in Korea.

Walter L. Ehrich has resigned as superintendent of the Bonanza Belt Copper Co., at Johnson, Arizona, and has moved to New York.

Walter G. Perkins, smelter superintendent for the Nevada Con. Copper Co., is taking a short holiday on the coast of southern California.

Bertram Hunt has gone to Alexander City, Alabama, to conduct metallurgical tests for the Hillabee Gold Mining Co. He will proceed thence to Mexico.

F. W. Harbord has entered into partnership with Edward Riley, and the firm of Edward Riley & Harbord will have offices at 16 Victoria street, Westminster, London.

Arthur Feust has resigned as manager for the Standard Con. Mining Co. at Bodie, California, and has been succeeded by W. H. Landers, of San Francisco.

Cecil Pocock, formerly with the Santa Fe Gold & Copper Mining Co., has recently been appointed general manager of the Montezuma Mines, Inc., with mines at Montezuma, Costa Rica, Central America.

R. W. Brock, acting director of the Geological Survey of Canada, has been on an official visit to the Slocan district, British Columbia, where W. H. Boyd and O. E. LeRoy, members of the survey staff, are preparing to make a geological survey of the district.

Obituary.

William Carkeek died at his home in Los Angeles on October 21. He had suffered from a complication of diseases, the principal being asthma. Born in Cornwall, England, in 1856, he became a resident of this country in 1877, engaging in mine and mill work in Colorado and Idaho. There were four brothers in the family and all of the brothers were interested in the milling of ores throughout their lives, their field of work being Colorado, Idaho, and Montana. In 1883 William Carkeek became superintendent of the concentrator for the Colorado Mining Co., at Butte, Montana. He remained faithful to this company for 19 years and became a local authority on practical concentration. His health failed in 1902. It is the opinion of many that his lungs became congested with small particles of mineral. He sought southern California and then Arizona for relief. While in Arizona, in 1903, he still maintained strength enough to design and erect the Shannon Copper Co.'s concentrator. His wife accompanied him throughout Arizona and in 1904 they took up their residence at Los Angeles. In 1907 he resolved to make a trip to Montana, to see if it were not possible to recuperate in a colder climate. This trip proved disastrous, hastening his death.

Latest Market Reports.

LOCAL METAL PRICES—November 5.

Antimony	12@16c	Quicksilver (flask)	$44@45
Casting Copper (scrap)	8½@13½c	Spelter	6¼@7c
Pig Lead	4.55@5.50c	Tin	32@33½c

ANGLO-AMERICAN SHARES.
Cabled from London.

	Oct. 29. £. s. d.		Nov. 5. £. s. d.
Camp Bird	0 15 0		0 15 0
El Oro	1 3 9		1 3 9
Esperanza	3 3 9	ex div.	3 2 6
Dolores	1 10 0		1 10 0
Oroville Dredging	0 9 0	ex div.	0 9 0
Stratton's Independence	0 1 0		0 1 3
Tomboy	1 0 7½		1 1 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Oct. 30	13.63	4.33	4.84	50
" 31	13.69	4.35	4.86	50⅛
Nov. 1	Sunday.	No market.		
" 2	13.69	4.35	4.86	50
" 3	Holiday.	No market.		
" 4	13.69	4.35	4.90	49⅞
" 5	13.81	4.38	4.90	49⅞

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Oct. 29.	Nov. 5.
Amalgamated Copper	80¼	83¼
American Smelting & Refining Co.	93½	94¾
Boston Copper	14½	14⅝
Butte Coalition	26¾	27⅛
Cumberland Ely	8⅛	8¼
Dolores	7⅛	7¼
El Rayo	4⅛	4
Giroux	4	4
Greene-Cananea	10½	11⅛
Indiana Sonora	5⅛	4¾
La Rose	6½	6¾
Miami Copper	11⅝	12⅜
Nevada Consolidated	17¾	18½
Newhouse	5	5
Nipissing	9½	10⅞
Ohio Copper	4	4½
Tennessee Copper	46½	44⅛
Utah Copper	43⅜	43¾
Yukon	4⅜	4½

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, November 5.

Atlanta	$ 24	Laguna	$ 1.10
Belmont	1.15	MacNamara	52
Booth	33	Manhattan Con	6
Columbia Mtn	21	Midway	29
Combination Fraction	1.30	Montana Tonopah	80
Daisy	1.00	Nevada Hills	1.50
Fairview Eagle	35	Rawhide Queen	65
Florence	4.10	Sandstorm	24
Gold Bar (Bullfrog)	3	Silver Pick	16
Goldfield Con	6.55	St. Ives	27
Gold Kewenas	30	Tonopah Extension	58
Great Bend	34	Tonopah of Nevada	7.05
Jim Butler	23	Tramp Con	16
Jumbo Extension	31	West End	54

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. November 5.		Closing prices. November 5.
Adventure	9	Mohawk	68
Ahmeek	110	Nevada Con	18¾
Allouez	37½	North Butte	86⅛
Amalgamated	83¼	Old Dominion	54½
Arcadian	4	Osceola	119½
Atlantic	18	Parrot	28
Boston Con	14½	Quincy	94
Butte Coalition	27½	Rhode Island	4¼
Calumet & Arizona	124	Santa Fe	1¾
Calumet & Hecla	660	Shannon	18¼
Centennial	35½	Superior & Pittsburg	17½
Copper Range	79½	Tamarack	82
Daly-West	9	Trinity	19
Franklin	14	United Copper Con	14¼
Granby	100	Utah Copper	43¾
Greene-Cananea, ctf	11⅝	Victoria	5
Isle Royale	23	Winona	6½
Mass	5½	Wolverine	143

Dividends.

Bunker Hill & Sullivan, No. 134, November 4, $75,000.
Standard Consolidated, No. 117, September 22, $17,839.

General Mining News.

ARIZONA.

COCHISE COUNTY.

It is said that the Shattuck-Arizona is planning to erect a smelter and expects to soon be a shipper of high-grade ore. The shaft is 935 ft. deep, the deepest level being the 900. A body of good sulphide ore has recently been opened up on the 600-ft. level and prospects seem bright. Shattuck-Arizona occupies the highest elevation of any copper producer of Bisbee.

MOHAVE COUNTY.

Two carloads of machinery for the Arizona Gold Mines Co., which is soon to have a 10-stamp mill in operation on the Bi-Metal mines, have arrived, and the mill near Kingman is expected to be in operation within 40 days, and will be equipped with electric lights and every labor saving device known to the business. The plant will be built with a view to increasing it to 100 stamps. A spur track is to be put in for the use of the Company by the Santa Fe and the work of grading is now in progress from a point above McConnico.

PINAL COUNTY.

It is reported that the Benson group of 14 claims, in the Ray-Kelvin district, has been taken over by the Ray Consolidated and that negotiations are under way for acquiring the Kelvin-Calumet. The Ray mill is to be started soon.

YAVAPAI COUNTY.

(Special Correspondence).—Three shifts of men began work last week sinking the shaft of the Big Stick mine at Santa Maria. This is one of the properties belonging to the Manhattan Securities Co., of New York, and is under the management of Lloyd C. Haynes, president of the Company. Mr. Haynes is making arrangements for developments on a much larger scale than heretofore, which includes the erection of a 20-stamp mill. Plans are formulated for the sinking of the present shaft 1000 ft., cutting stations at intervals of 100 and 200 ft., and to this end machine drills have been placed in operation. The other property belonging to the Manhattan is the Haynes copper mine, at Jerome. Developments on this property are very encouraging, and work is being pushed with vigor. The Company has expended over $300,000 in development work and in the purchasing of machinery the past year.——The Mikado mine, in the Eureka district, has recently found a streak of ore three feet thick, assays from which average about 160 oz. silver, 50% lead, and some gold and copper. This find was made in the breast of an adit which is 312 ft. long.——E. B. Van Deman is preparing to start work on his McCall group of claims in the Weaver district.

Phoenix, October 31.

YUMA COUNTY.

The Crackerjack claims, 12 miles southwest of the North Star and King mines, have been bonded to a group of Los Angeles capitalists for $250,000. The property was located only five months ago, and since then a 50-ft. shaft has uncovered ore averaging $75 in gold. It is said the new company intends to build a mill.

CALIFORNIA.

NEVADA COUNTY.

(Special Correspondence).—Some time last Wednesday night thieves looted the vault at the North Star assay office and carried off a considerable quantity of precipitate from the cyanide plant. The crime was one of the boldest ever committed in this city.——Tunnel No. 7 at the South Yuba mine is being pushed steadily and is expected to cut the orebody within a short time. It is 600 ft. below the old workings and will give about 1200 ft. of backs. The company expects to erect a 50-ton smelter as soon as sufficient ore has been developed. The main orebody has been penetrated for 50 ft. with no sign of the opposite wall. The mine is a copper proposition. Max Martinette is superintendent.——The Conlan M. Co. is liquidating a number of its local debts, and it is thought that the property will resume operations in the near future.——Charles Cole and Williamson Bros. have filed a suit in the Superior Court against the Washington M. & D. Co. involving title to the Red Ledge mine in the Washington district. A demurrer has been filed by the defendants.

Grass Valley, November 2.

SAN BERNARDINO COUNTY.

Hart & Hitt have sold their Oro Belle No. 1 and No. 2 claims, at Hart, to a Philadelphia company for $100,000. The Eastern concern is represented by A. B. Hall, who has now gone East to complete final arrangements. It is said that on his return, in three weeks, 75 men will be started in the mine and that a large stamp-mill will be erected. A nominal cash payment was made and a large installment is due within 30 days.——It is reported that the Big Chief Mining Co., of which George A. Foster is president, is considering the building of a stamp-mill on its property near Hart.——The working force at the Jumbo has been practically doubled during the last week. The work is

Map of California.

centred on driving on the 100 and 200-ft. levels, the showing on the latter being particularly encouraging. George B. Wilson, of Searchlight, is superintendent.

SHASTA COUNTY.

Indications of oil have been found in drilling an artesian well about two miles east of Anderson. The well is 190 ft. deep and the water is said to bring up considerable oil.——A small crew of men is engaged in sinking on the Summit mine on Little Backbone creek. The shaft, which is following a clay gouge, is at a depth of about 150 ft. below the level of the adit, giving a total depth from the surface of about 300 ft. Although no great strike has been made, conditions are very encouraging. An electrically operated compressor furnishes air for drilling, hoisting, and pumping.

SIERRA COUNTY.

A San Francisco company, headed by J. J. Crawford, has bonded the claim near Lucky Dog ravine which belongs to Bixby & Son. The new concern will start work at once.——A complete equipment of electrical mining machinery is being put in on the No. 4 level of the Croesus mine at Plumbago. The lower adit will be extended 5000 ft. and will then strike daylight on the Kanaka Creek slope. Pending the completion of the new power plant, all of the

miners underground have been laid off except four, but a force of 20 men is employed in the construction work. As soon as the new plant is finished, which will be about Thanksgiving time, the regular force of 50 miners will be reinstated. W. W. Mather is manager and W. H. Schley, of New York, is president of the Croesus G. M. & M. Company.

SISKIYOU COUNTY.

A company of San Francisco capitalists, headed by V. G. Bonaly, has purchased the Shumway and Forest properties on the North Fork of Salmon river. Work is now under way on a four-mile flume to carry the water to the claims. John Fehely and P. L. Young have charge of operations. ——Other properties on North Fork are getting things in shape to start sluicing and indications are good for an active season.

TUOLUMNE COUNTY.

McCormick & McPherson have received a new Huntington mill for their Free Gold property near Jacksonville.—— Robert Fitzgerald and others, of Quartz Mountain, have bonded the Water Lily placer, near Reynolds Ferry, to Wingfield Sheekler, of Oroville. He will test the ground by drills and if it shows indications worth attention he will dredge it.——Thirty of the sixty stamps are dropping at the Harvard.——The Hazeldell, near Italian bar, is being unwatered, and the owners intend to start development at once.——Operations have been resumed at the Spotted Fawn above Columbia.——It is reported that the Longfellow at Sonora has been sold and that operations are to be started at once.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Work has been resumed at the adit on the Key West property, on Leavenworth Mtn. The first vein to be cut is the Key West, which should be reached within 100 ft. From shaft workings ore was mined a number of years ago that milled as high as 2 oz. gold and 150 oz. silver per ton. The property has been secured under bond and lease by E. Butts, who is now forming a company composed of Minnesota capitalists. A plant of machinery is to be put in at an early date to facilitate the work that has been planned.——Shipments will be started next week from the Drummond mine on Columbian Mtn. During the past few weeks work has been in progress and a streak of ore has been followed for over 200 ft. that is from 10 to 14 in. wide, the average content being about $45 per ton in silver and lead. Sinking has been started in the bottom of the winze, now down 90 ft., and a fine streak of medium-grade ore is being followed. The engine and boiler have been brought into use. Machine drills will be installed at an early date. This property is held under bond and lease by the Golden Glory T. M. Co., managed by A. A. Hayden, of Denver.——Another vein was reached this week in the breast of the Prudential adit, and as soon as the hanging wall is reached driving east and west is to be started. It is the intention of the company to shortly install machine drills, as the ground is unusually hard and progress is slow by hand-work. J. J. White is manager.—— Beginning next week extensive developments are to be put under way at the mines of the Capital M. & T. Co. The adit, now in 4700 ft., is to be advanced for an indefinite distance, as over 1300 ft. of ground lying ahead of the present breast is controlled. The first vein to be cut is the extension of the Sporting Times, which should be reached within 75 or 100 ft. Pending the preliminary work the night shift at the mill will be dispensed with, but all the employees will be put to work in the mine, and extra men will also be added. Since last February on an average of 130 tons of ore per day has been mined, but the output in the future will probably reach 75 tons. During the last week a number of stockholders from Pittsburg, Pennsylvania, have been in camp making an examination of the property. W. M. Cooper is manager.——The Wheatland mine, situated up Trail creek, is to again undergo development. W. S. Wells, of New Haven, Connecticut, the owner, has been in the district for several days and has formulated plans for continued work. Driving will be started in the upper workings. This property was a former heavy producer of silver, gold, and lead ore.—— The Memphis & Idaho Springs M. Co. will resume work at once on the properties owned on Seaton Mtn. The Company has just been re-organized and funds raised for an extensive campaign of work. Driving will be started on the veins that have been intersected by the Newhouse adit. Woodruff & Malone, of Denver, have been appointed representatives of the new organization.——The plant of machinery for the Merry Monarch M. Co., operating in the Alice district, arrived last week and is now being transported to the mine.——H. L. Williams, leasing on the Specie Payment, has shot into a 10-in. streak of smelting ore that mills better than $65 per ton in gold.——J. W. Smith, of Dumont, reports that he expects to have the property of the E. S. James Co. in shape for producing in the near future. The showing is improving from day to day and there is a streak of $40 ore in the breast of the adit that is from 9 to 15 in. wide.——Within the next two weeks extensive development will be started at the Smuggler mine on Brown Mtn. In addition to deepening the shaft 75 ft., the east and west drifts on the third, fourth, and fifth levels are to be extended. This property has been a steady producer for the last three years, but owing to poor management it became necessary to re-organize the company. As a result the Main Gulch M. & M. Co. becomes extinct, new capital having been invested.——The machinery at the Mint mine, McClelland Mtn., was started a week ago and now the adit is being advanced at the rate of five feet per day. The first vein of any prominence will be reached within 100 ft. J. U. Harris, of Silver Plume, is manager.

Georgetown, October 31.

LAKE COUNTY.

The Independent District Consolidated Mines Co. has recently been incorporated at Leadville and will at once take up the work on the Berdella and Rosse adits which was started last summer by a Kansas City concern. Joseph A. Lamping is president. The Berdella is already into the hill a distance of 310 ft. and a force of men is now at work under direction of the new Company. W. C. Davis, a stockholder and director in the concern, is superintendent. The Rosse, formerly known as the St. Kelvin, is in Sowbelly gulch and has been worked with varying success for some time. The bore is now in 600 ft. and a contract is to be let at once for an additional 200 ft. The objective is the St. Kelvin vein.——Placer mining on the Cache creek, in the southern part of the county, is at an end for this season. The recent cold has compelled all operators to close down. It is estimated that nearly $100,000 has been mined this year.

OURAY COUNTY.

R. W. Clinton, superintendent of the First National group of claims near Ouray, is authority for the statement that as soon as the blower is installed in that property a systematic plan of development will again be resumed. The title to the property rests with the First National Co-Operative Mines, of which the officers receive no salary and the miners own a large part of the stock. Daniel George, of Denver, is president. The group consists of 79 acres on the slope of Mt. Hayden.

SUMMIT COUNTY.

The Cochran property, operated by the owners of the Wire Patch mill, was started last week with electrical equipment. A compressor has been placed in commission, and one drill will be used until progress is fairly started, after which another drill will likely be added. It is proposed to push the adit as rapidly as possible under this arrangement. A large orebody is in sight which will be treated at the Wire Patch mill.

TELLER COUNTY.

The control of the Pharmacist Con. M. Co., operating in the Cripple Creek district, has passed to A. J. Halter and associates of New York. Mr. Halter has been elected president and J. S. Edwards, of Cripple Creek, will be man-

ager. The policy of leasing the holdings will be continued and several new applications have already been received. ——The Union Leasing Co., lessees on the Gold Dollar Con. estate, shipped twenty-seven cars of ore during the month of October. Most of the ore came from a stope above the 400-ft. level. Sinking will soon be resumed in the shaft.——Dick Blanchard and associates, leasing on the Hiawatha, a fractional claim on the southwestern slope of Beacon hill, have purchased the machinery on the Flying Cloud on Bull hill and have contracted for its transportation to the Beacon Hill property.

IDAHO.

IDAHO COUNTY.

James Hand, a pioneer miner in the Northwest, has bonded the Hand group in the Big Creek district, 35 miles south of Grangeville, Idaho, for $125,000, and has cleared the title to the property, which consists of 15 claims. He has exposed a vein of from 60 to 200 ft. wide between well-defined walls of slate. The ore is of a milling quality, running from $6 to $8 per ton. There are stringers of ore in the mine that assay from $200 to $1000 in gold per ton.——Eastern capitalists have bonded 160 acres of dredging ground in the Elk City district owned by the Massam Bros., of Spokane, and will put in a dredge, capable of handling 2500 yd. of gravel per day. The Eastern men have expended $3500 in exploring the property, and are so well satisfied with the showing that they will at once proceed with their plans of development. The first payment of $15,000 will be made November 15, which will leave a balance of $35,000, to be paid in installments.

NEZ PERCE COUNTY.

Final shipments of bullion for the season are being made from the camp at Pierce, and the gold properties alone have shipped $78,000, which is an increase of $10,000 over last year. The 15-mile wagon road built by the Oxford Copper Mining Co. from Pierce to the holdings of the Company on Elk creek has been completed. A hoisting and pumping plant will be installed in the near future, and work on a double-compartment shaft to a depth of 300 ft. will soon be completed.

SHOSHONE COUNTY.

(Special Correspondence).—About eight feet of good carbonate ore of shipping quality has been opened up in the drift on the vein in the Black Bear mine. This drift has now attained a depth of about 1200 ft. and there is every indication that the ore-shoot proper may be broken into at any time. The claims of the company adjoin the property of the Helena Frisco mine on the east.——A contract for 500 ft. of driving on the Valentine group of claims has been let to Andrew Jacobson. The drift in the property has already been run about 500 ft. and it is expected that the ore-shoot may be broken into at any time.——The Montana-Standard mine, on Prospect creek, has been compelled to curtail its production on account of the want of facilities for ore storage, all the bins being filled to their capacity. A large amount of first-class shipping ore has been stored and shipments of this will commence as soon as enough snow has fallen. The directorate of the company is at present considering the advisability of erecting a concentrator to handle the second-class ore.——The new hoist has been installed on the property of the Anchor Co., in the Burke district, and sinking on the orebody has again started. The hoist is designed to sink to the 300-ft. level, to which depth it is proposed to sink and then drive to the vein. About $15,000 worth of ore has been blocked out during the recent operations.——The Coeur d'Alene Mining Co., which owns 2800 acres of patented placer land in the Murray district, intends to install hydraulic machinery and work the property extensively next year. The Company worked in one pit in the bed of the creek this year, but owing to the fact that the bedrock is uneven and the rocks were too heavy for the eight-inch elevator to handle, the experiment was not successful. It is probable that the Company will install machinery on Pritchard creek to handle the ground, the rock being stacked on the side hill, permitting the bedrock, which is a hard quartzite, to be hand cleaned.——Judge Frank S. Dietrich, of the U. S. Circuit Court for the district of Idaho, Northern Division, has ordered that the judgment entered in favor of the plaintiff, November 1, 1905, in connection with the suit of James L. Safford against the Bunker Hill & Sullivan Mining & Concentrating Co. for $7600 be vacated and set aside. Safford had an agreement with the Bunker Hill company for working the tailing from the mill in the creek, and claimed that by the acts of the Company he was prevented from working.——A contract for 250 ft. of adit work has been let to John Backlund, of Burke, the work to be done on the property of the West Hecla Mining Co. This adit has already been driven about 1100 ft. and it is thought that the last contract will be more than sufficient to carry the work to the vein. Heavy stringers of ore, some of which are as much as 18 in. wide, are appearing in the face of the adit.——A judgment has been issued in favor of the plaintiff in the case of A. D. Gritman against the Charles Dickens M. & M. Co. The suit was brought for the recovery of about $55,000, the larger part of which is secured by a mortgage over the Company's property. Other suits to the extent of $40,000 are still pending against the property. Considerable feeling has been stirred by these suits by disappointed stockholders, many of whom had regarded the mine as one of the most promising in the district. A meeting of the brokers of Spokane has been called to take action in this matter and an attempt will be made to get the independent stockholders together to see if the business of the Company cannot be settled by means of assessment or otherwise and at the same time change the management.

Wallace, October 31.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—The Henskin mine, northwest of the old Galena camp, has been recently opened up and a rich ore deposit is being worked at 75 ft. The ore was worked out in drifts under the M. K. & T. railroad tracks and at this point the mine caved. Since that, the company has been engaged in strengthening the ground to re-open it. A company on an adjoining lot is sinking a shaft to catch the same run. The ore is zinc-blende.—— Pat Ryan and associates have discovered a rich run of silicate ore northwest of Galena. The shaft entered the ore at 78 ft. Development has demonstrated the existence of a large area of mineralized ground. A horse-whim is now being used, but steam hoist and boilers are being installed. A walking beam pump is sufficient to handle the water. In the same vicinity, Ashen & Co. have developed a run of silicate at 75 ft. which shows a 12-ft. face. Boulders weighing from 60 to 200 lb. are being removed. The larger pieces are ready for the market, but the finer ore is treated on a custom mill. A small amount of free-lead ore is found also.——The Lizzie D. Co. at Peacock is planning for the erection of a 150-ton mill in the near future. The Company is operating in a shaft 188 ft. deep, the face being 14 ft. high. The ore is heaped up awaiting treatment.——A St. Louis company, under the local management of Ed. Sparrow, is developing a tract at Badger. A shaft is in ore at 180 ft. Extensive development and prospecting has been done and indications suggest a sheet-ore formation. What was supposed to be bedrock has been found to be full of ore. ——The Riverside mine at Peacock is to be revived after a shut-down of more than a year. This mine at the time of closing was driving under the channel of Spring river, having opened up an old underground water course. The company ceased operations, fearing that blasting would destroy the roof of the drift and cause the river to flood the rich Peacock district, as it is practically all connected by this old water channel. Operations are to be resumed, but now driving will be done in an opposite direction to develope the old channel at some distance from the present river channel. A 125-ton plant is on the ground.——Repairs are being made at the Virginia mine in Baxter Springs to re-open that plant after a shut-down of more than a year. The Mason mill is also to be re-opened. When last worked

it carried a 37-ft. face of ore running 5%.——The Afton mill has been leased by J. W. Rice and operations started. This plant has not been operated for two years.——The Good Luck mill, recently completed, is still working on the dump pile. As high as a ton per hour has been made the past week. Underground work will be started the coming week, as the dump is nearly worked out. Both shafts will be opened. One shaft shows a fine run of galena.——The Heap-O'Brien property is developing a 30-ft. face of rich galena and zinc-blende in a thorough manner. The company plans the early erection of a modern plant to handle the deposit.——The Joanna lease has been taken over by J. W. Creech, of Joplin, and the property is being re-opened. A large pile of block galena is in the bins and both galena and silicate are ready to be hoisted.

Galena, October 29.

MISSOURI.

LAWRENCE COUNTY.

(Special Correspondence).—General activity increases in the Aurora camp at the extreme eastern end of the district. Strikes have been made recently on the Sphalerite, the Boston-Aurora, Cleveland-Aurora, and Big Bonanza tracts. A large part of the turn-in comes from the shallow mines. About 16 new shafts are being sunk.——The United Zinc Co. has started the pumps at its No. 6 and 8 shafts and will commence work when the ground is drained. The mill on the property has been closed down for ten months, but weekly turn-ins have been made by the sub-leases on the shallow ground.——Practically all the properties in the Sarcoxie camp are active. A shaft is down 200 ft. on the J. W. Boyd land, west of town, and driving has been started at 160 ft. A concentrating plant will be erected. The ore in this camp occurs from 16 to 160 ft., the shallower runs being mainly silicate, while the deeper deposits are very rich zinc-blende. At a depth of 14 ft. a rich vein of silicate was discovered on the Henry Cale land west of town.——The contract has been let for the erection of a mill on the Cameron lease on the Boyd land. The company has been engaged in developing the tract for the past three years. A large shaft is sunk and the ground thoroughly tested in every direction. The ore is high-grade zinc-blende.

Aurora, October 30.

NEVADA.

ESMERALDA COUNTY.

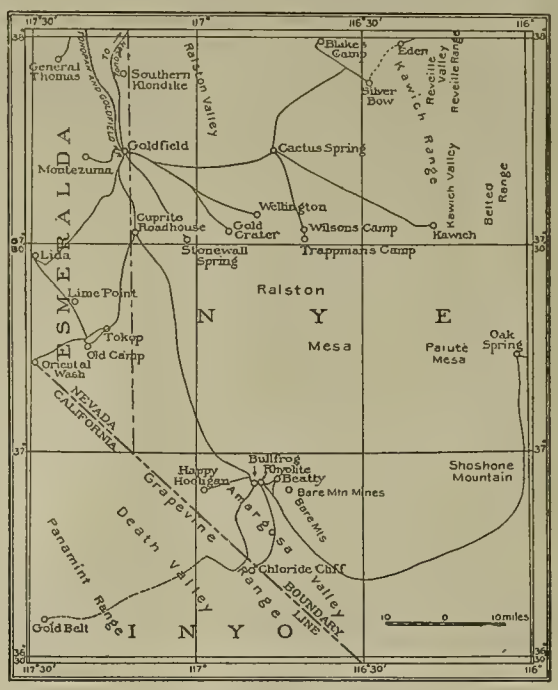
The February Premier M. & L. Co. started work last week on its lease on the February claim of the Consolidated, at Goldfield. The head-frame was moved from the January and a 40-hp. electric hoist has been put in. J. F. McCambridge is in charge.——A larger compressor was put in at the Baby Florence last week, the old one proving too small.——The Gold Bar Fraction Mining Co. has let a contract to J. M. Beach for 250 ft. of shaft work at $26.50 per foot, the contractor to furnish all material, tools, and labor. ——The Goldfield Cl Mill Co. has contracted with L. K. Koontz for 500 tons of ore from the Gold Bar mine.—— The Wilson lease on the Grizzly Bear has been assigned to the Grizzly Bear Mining Co., which is composed of Goldfield men.——The C. O. D. Consolidated Co. has granted a new lease to the C. O. D. M. & L. Co., beginning November 1, when the present tenure expires. John Donnellan & Co. has secured control of the Company's stock and will re-organize with a new board of directors and officers.——The statement of operations during September of the various properties of the Goldfield Consolidated Mines Co. shows a gross profit of $123,689, which includes losses of $17,989 and $1511 on the operations of the Goldfield Mohawk Mining Co. and the Jumbo Mining Co. respectively. The Combination mill treated 2267 tons of an average value of $69.66 per ton. The following extractions were obtained in the different processes: 52.616% by amalgamation, 20.904% by concentration, 23.929% by cyanidation, or a total of 97.449%. The cost of mining 4394 tons of ore was $3.15 per ton; the cost of milling 2267 tons was $6.13 per ton. These figures include development and general expenses. The only other earnings of the Consolidated were royalties from its various leases.

HUMBOLDT COUNTY.

After a shut-down of six weeks, occasioned by a broken cam-shaft, the Kindergarten mill at Seven Troughs resumed operations last week. The mill is at present working on Kindergarten ore of the value of $90 per ton. After running through approximately 100 tons of this ore the mill will be turned over to the Wihuja people, who will also run 100 tons. The Wihuja ore, though conservatively estimated, will go $175 per ton. Following these two runs the Seven Troughs mine will take over the mill for a run of several hundred tons of Fairview rock.

NYE COUNTY.

A suit was filed in the District Court last week by the Daisy Mining Co., of Round Mountain, and J. J. McSorley, one of the directors, against F. W. Nixon and F. W. Stebbins, alleging that by an agreement in writing the said parties agreed to sell and convey to the plaintiff certain water rights and water of the Shoshone and Jefferson creeks for the sum of $25,000, and to deliver a good and



Part of Nevada.

sufficient deed to said water rights to the plaintiff, and that they have refused and neglected to do so, notwithstanding that the sum agreed upon has been paid.——Steady development and prospecting work is being carried on throughout the Midway property, and a great deal of new ground is being opened up. Several of the cross-cuts are in a very promising formation, and it would not be surprising to hear of the cutting of a new orebody any day. During the week the regular shipment of 100 tons of ore went out to the mill.——Corder & Berle started work on the Wall Street mine last week. They have a big body of ore that runs between $40 and $60. The Wall Street mine is in the South Bullfrog district, and Los Angeles capitalists are interested in it.——A carload of ore was shipped from the Tramp Consolidated mine last week to the Taylor & Brunton smelter at Murray, Utah. The car contained 22 tons of ore, taken from the Denver vein, and of an average value of $100 per ton.——It is expected that the Campbell & Smith custom mill at Beatty will be ready to operate within six weeks.——The mines of Tonopah produced during the week ending October 31 a total of 5108 tons of an estimated value of $129,275.

WASHOE COUNTY.

Alleging gross mismanagement on the part of the present officials of the Selby Consolidated mine at Jumbo and stating that on account of this mismanagement many thousands of dollars are being lost. Fred Stadmuller, a heavy stockholder and secretary of the Company, has filed complaint against the Selby Consolidated M. & M. Co., asking that a receiver be appointed by the court to take charge of the mine and work it according to the orders of the court.

NEW MEXICO.

GRANT COUNTY.

Sylvanite, a new camp, 12 miles south of Hachita and 23 miles north of the Mexican boundary, is attracting considerable attention because of the discovery of rich gold ore. The district is not a new one and mining of low-grade ore has been carried on in that locality for more than a century. It was at the exact location of the new camp that the dry placer boom failed last February. Some of the prospectors attracted by the latter remained in the hills and have found the rich ore which is the cause of the present excitement. The exact nature of the ore is the subject of considerable discussion among mining men and geologists, some maintaining that sylvanite is present and others that the white tin-like mineral is tetradymite. However, none dispute the fact that free gold is present in quantities varying from $80 to $300 per ton. The proximity of the camp to railroads and smelters makes it particularly attractive, and it is claimed $15 ore could be handled at a profit.

WASHINGTON.

FERRY COUNTY.

H. R. Alexander and Claire Gray are preparing to begin operations on the Summit, on Silver creek, in the Keller district. This is a silver-lead property which did so much to give the district prominence. The orebody is five feet wide and of high grade. It is opened to a depth of 150 ft. by an incline shaft. A level has been driven a long distance at that point and the mine is therefore in shape to take out a large quantity of ore without further development. It is equipped with a horse-whim, and being on the summit of the range east of Keller, the water will not be difficult to handle or cause much inconvenience.

OKANOGAN COUNTY.

Number One Mining Co., of Nighthawk, will install a 25-ton concentrating plant to handle its own ores. A. B. Lee, a director, announced at the close of an inspection, that the plant will be in operation next April. The property is owned by Ohio capitalists. Development work is being pushed on a drift on the vein, which gives a depth of 200 ft. Mr. Lee says the vein is 33 ft. wide, with 9 ft. of concentrating galena and copper ore.——The management of the Nighthawk mine, near Oroville, will increase the capacity of its new mill to 200 tons as soon as possible. The ore now handled is a soft quartz and easily crushed. The company expects to treat 60 tons per day until the alterations are made. A huge vein of high-grade silver ore has been opened on the mine, and there is enough ore in sight to supply the mill.——Work on the Golden Zone, near the Nighthawk, has been resumed after a shut-down of several years. This mine is one of the oldest properties in that district and thousands of dollars have been expended in development work.

CANADA.

BRITISH COLUMBIA.

J. A. MacLeod and H. A. Shallenberger, of Spokane, have bought the Hastlings group of ten claims, comprising 500 acres of ground at the junction of the Salmon and Pend d'Oreille rivers, 16 miles east of Waneta. This property has been known for years as the biggest deposit of hematite in southeastern British Columbia, but only recently has it been discovered that the iron was the capping of an immense lead-silver deposit. This hematite deposit is more than 4000 ft. long and 200 ft. wide. Open-cuts and short adits have shown up large bodies of lead and carbonate ore running from 40 to 60% lead, with some gold and silver. Along the course of the lode immense quantities of hematite, carrying on an average of 62% iron and from $2 to $5 gold are exposed. Ten men are doing development work. ——Announcement is made in Spokane that the option for $65,000 obtained on the Golden Zone mine, near Hedley, in behalf of the Daly estate, last summer, has been forfeited. The option was secured by G. P. Jones, superintendent of the Nickel Plate mine at Hedley, but the general impression is that it was for the Dalys, who own a controlling share in the Nickel Plate property. The mine is a gold property and has a 5-stamp mill.——Centre Star mine, of Rossland, British Columbia, is now shipping more ore than ever before, due to the increased facilities afforded by the Trail smelter. Taking the Centre Star and the Snowshoe of the Boundary together, more than 1000 tons of copper ore is treated daily. In addition to this there are 2000 tons of lead and other ores being put through the furnaces every week.——Reports from Nelson are that the Queen Victoria mine of British Columbia is now under bond to Senator Clark, of Montana, the amount paid being $80,000. A compressor has been installed and the new wagon-road is completed. Seventy-five men are employed, and it is stated that 500,000 tons of ore is blocked out.

MEXICO.

CHIHUAHUA.

(Special Correspondence).—The property of the Sahuayacan Mining Co., of Pittsburg, comprises 120 pertenencias in the Rayon district, 125 miles west of Miñaca, a station on the Chihuahua & Pacific railroad. It has been a steady producer for several years, though its production has been curtailed this year. The working shaft is 600 ft. deep and there are some adit levels from the surface. In all there are 10,000 ft. of development on a vein that strikes northeast-southwest between an andesite hanging wall and a shale foot-wall. The ore runs ₱25 to ₱30 per ton in gold and silver, 90% of the product being recovered on the amalgamating plates in the 20-stamp mill. Steam power is used for all purposes, though a water-power installation may be made next year for operating the mill. George E. Howard, manager for the Company, states that the Sahuayacan is being acquired by the Pennsylvania-Mexican Co., which is also expected to get control of the Santa Teressa, an adjoining property which has blocked-out ore valued at ₱750,000. By building an extension to the Sahuayacan tramway the ore from the Teressa may be delivered to the mill.

Miñaca, November 1.

SONORA.

(Special Correspondence).—The mine of the Lucky Tiger Combination Gold Mining Co., situated 30 miles east of Ysabel station on the Nacozari railroad, is under option to the Consolidated Mines Selection Co., of London, at $6,500,000. The terms of sale, if the option be taken up, call for half cash on January 1, 1909, and the remainder in one year thereafter. The preliminary report on the property was made by Frederick F. Sharpless, of New York, for the London company. At El Paso it is the impression that the sale will go through. The price named is at the rate of $100 per share for the stock of the Company. The mine is opened by adit levels and has 17,000 ft. of development work. A depth of 850 ft. on the principal vein has been attained by a system of adits, all but one of which enter on the vein. There are two veins, but the one on which most of the development has been done is 4 to 6 ft. wide, having a dip of 65 to 75° to the west. The ore consists of sulphides of lead, iron, copper, and zinc, carrying gold and silver. It is stated that the shipping ore and concentrate produced at the 30-ton mill will average 300 oz. silver and 2½ oz. gold per ton. The vein strikes north-south through a rhyolite country. The most of the stock of the Company is held in Kansas City, S. C. Sooy being president.

Nacozari, October 27.

Special Correspondence.

LONDON.

Definition of 'Mineral'.—Lawsuit over China Clay.—Expert Opinions.—A New Explosive.—Cornish Mining.

In Mr. Rickard's book on 'Technical Writing' reference is made, among other things, to the confusion caused by the many different meanings of the word 'mineral'. A most interesting example of the conflicting ideas regarding common terms is to be found in the recent lawsuit between a railway company and a china clay company, in which the whole dispute turned on the question as to what a 'mineral' is. This lawsuit was heard in the Court of Chancery, and in order to preserve my reputation of being up to date, I ought to have written something for your pages on the subject before now. I have to confess that this delay on my part has been due to my inability to find the real cause for the necessity for such a lawsuit. It lasted for a week or so. Eminent lawyers conducted the case, and the witnesses included names that are household words in the mining world. I have read the arguments and the evidence, also the Judge's decision. It was only when I discovered that the parties were talking at cross-purposes over the meaning of the word 'mineral' that I fathomed the case. The lawsuit was brought by the Great Western Railway against the Carpalla China Clay Co. and Lord Clifden, to prevent the continuance of excavations near and under the railway company's land. The spot where the workings are situated is in Cornwall, near St. Austell, in the celebrated china clay district. The part of the railway effected is a short branch line built specially for china clay traffic, and not used for public passenger transport. The railway company, or at least the company that was the predecessor in the ownership of the line, bought the land from Lord Clifden's father in 1881. The purchase was made according to the terms of the Railway Act of 1845. By this act the purchase of the railway acquired only the soil and the sub-soil, and did not "become entitled to any mines of coal, ironstone, slate or other minerals lying underneath or near." The Carpalla company also acquired their land from Lord Clifden, hence his Lordship's inclusion in the suit. The land occupied by the Carpalla company adjoins the railway company's land, and their workings had recently come within such a distance of the railway as to endanger its stability. Accordingly the Carpalla company gave notice to the railway company according to the Act of 1845, which provides for these cases, but the railway company ignored the notice and, instead, brought this action against the Carpalla company and Lord Clifden, with the object of stopping the excavations in the vicinity of the railway. The railway company's argument was that china clay was not a mineral, and that therefore the Act of 1845 did not apply.

The evidence on the side of the railway company was given by Prof. Lapworth of Birmingham, Prof. Boyd Dawkins of Manchester, Dr. F. H. Hatch, and others. They gave interesting discourses on the origin and nature of china clay, and said it was not a 'mineral'. Their reasons for denying it the honor of this title were that it is a heterogenous mixture without definite composition, physical qualities, or crystalline form. They preferred to call it a weathered rock, or a rock débris, or a half-formed surface deposit not much different from a soil or sub-soil. They argued that recent microscopical examination has showed it to contain, besides hydrated silicate of alumina, a certain amount of mica, quartz, and unaltered feldspar, and in no case could they find the presence of the definite crystalline form of koalinite. This evidence and these views and opinions are of course of great interest, but they helped rather to give the mineralogist's definition of a mineral than to help the parties in the lawsuit to an agreement.

For the defendants an equally brilliant array of witnesses was brought, including Prof. S. H. Cox of the Royal School of Mines, Prof. J. W. Gregory of Glasgow, Mr. Benedict Kitto, Mr. J. H. Collins, and others. These gentlemen showed that china clay had always been considered as a 'mineral' until the witnesses for the plaintiffs had introduced this latest refinement in mineralogy. They stated that the whole china clay industry of Cornwall, and the laws and regulations relating to it, have been formed on the supposition that it is a 'mineral'. The Judge upheld this contention and gave his decision against the railway company. He congratulated himself on not having to sit as an arbiter in the latest phase of mineralogical science, and said that all he was called on to do was to give his judgment as to what is a 'mineral' within the meaning of the Act. He had no doubt whatever that an Act which referred to "coal, ironstone, slate and other minerals," intended that china clay should be included. In fact, to his mind, a 'mineral' within the meaning of the Act was any substance found in depth that gave to the land a value in addition to its surface value. The Act specifically mentions coal and slate, neither of which could be called a 'mineral' by the railway company's mineralogists. He also inferred that granite and other building stones are intended to be included among the 'minerals' of the Act.

It will thus be seen that to a mineralogist a 'mineral' is a substance of crystalline or similar structure with definite chemical properties and incapable of being separated into constituents. To a biologist a 'mineral' is any solid substance that does not belong to the animal or vegetable kingdom. An ordinary commercial man considers a 'mineral' to be anything in the earth below the soil that is worth digging out. To other people, a 'mineral' is a compound of a metal which is valuable for its metallic contents. Seeing that you have to pay lawyers' fees in getting a definition, it may appropriately be said that you "pay your money and take your choice."

A new explosive suitable for mining purposes is being introduced by influential people, called 'steelite,' named after the inventor, Mr. Everard Steele. So successful have the first results been that a company has been formed called Steelite Explosives, Ltd., with the object of raising additional capital. Among the directors are Prof. W. Galloway, well known as an authority on coal mining, and Mr. Max Muspratt, one of the famous family of chemical manufacturers. The special virtue of 'steelite' is that hygroscopic chemicals, such as nitrate of ammonia and chlorate of potash, can be used. Hitherto such substances have been barred because they attract moisture, and all efforts to keep them dry have been futile. According to Mr. Steele's invention, the nitrate of ammonia or similar substance is coated with a thin film of nitrated resin. This is effected by grinding the nitrate to fine powder and mixing it with from 10 to 15% of nitrated resin, and then subjecting the mixed powder in the form of a spray to the action of atomized alcohol or methylated spirit. The alcohol dissolves the nitrated resin and causes it to adhere to and surround the particles of nitrate. The process is not conducted in one operation. It is preferable to add the nitrated resin in installments and to spray several times with the spirit. The chemists and mining engineers who have examined the explosives produced by this process have reported favorably. The 'steelite' can be stored indefinitely without deterioration. It can be exploded only by a detonator, and it produces no fumes that are injurious to miners. The company will take over the experimental works in Lancashire and in Wales.

The troubles that come to Cornish mining are endless, and I have chronicled them in this column from time to time. The latest knock-down blow is the failure of Wheal Jane. This old mine, near Truro, was acquired by the Messrs. Schiff 18 months ago, and a company called the Falmouth Consolidated was formed to re-open it and equip it with modern plant. Plenty of capital was forthcoming from influential quarters in the English and German metal trade, and the engineers were F. Dietzsch and H. C. Jenkins. Large sums of money have been spent in erecting a

new plant. This plant was completed a month or so ago, and now we are suddenly informed that it will not work to specification. Most of the men have been discharged, and a meeting of creditors has been held. No doubt efforts will be made to provide more money, probably under new auspices and management. The reason alleged for the collapse is the failure of the ball-mills. There are four of them, each with an alleged capacity of one ton per hour. They are the invention of the eminent metallurgist, Emilio Ferraris, and they are made by Edgar Allen & Co., of Sheffield. I do not want to be unfair to the inventor or the maker. All new machines must have a trial, and no obloquy attaches to their first failure. What I want to point out is that mining engineers should not adopt new plant solely on the manufacturer's guarantee. This guarantee is no protection, for it only means that the manufacturer will have to make good the deficiency of the particular machine. It does not cover the cost of operating the mine and mill during the time the faulty machine is in work, or of the delay in providing a substitute. The company will require more money in addition to what will have to be spent on new crushing plant; for instance, no pumping has yet been done, and this will be absolutely necessary before any development can be carried out. The mine has been worked for generations above the adit, and it can hardly be expected that much can be found without extensive prospecting at lower levels.

JOHANNESBURG, TRANSVAAL.

Amalgamations.—The East Rand.—Mineral Output.—Diamond Mines.—Bushveld Tin.—Trades School.—Status of Engineers.

Barney Baranto, the famous speculator of the Kimberley and Johannesburg early days, was once asked chaffingly by an acquaintance how he would find further scope for his financial activities when he had consolidated all the mines into one concern and no further amalgamations were possible. He is said to have replied: "Well, my friend, I should proceed to split them up again." It seems that we are rapidly arriving at the stage when amalgamations will no longer be practicable, but the process of subdivision will only be evident upon the final exhaustion of the units of combination. The completed amalgamations of the Nourse mines, of the Village Main Reef and Wemmer, of the Village Deep and Turf mines of the East Rand Proprietary subsidiaries, and of the Simmer Deep properties, only mark the beginning of the policy that is being followed so energetically from end to end. The limiting factor is the division of Rand interests into different financial controls, not always disposed to combine forces. During the past week three schemes of amalgamation for mines in the East Rand have been carried. First, under Eckstein control, the consolidation of the properties of the Modderfontein Extension and Transvaal Lands & Mines Proprietary Syndicate into a new company with a nominal capital of £700,000. A sum of £494,000 is provided for immediate working capital, and as the property (of 1359 claims or, say, 2000 acres) is an outcrop one, production should be commenced in 1910. The other amalgamations, virtually completed, are those of the Chimes West & Benoni, and of the Van Ryn Deep and Kleinfontein Deep. All these properties have come into favor by the remarkable developments occurring in the Brakpan mines to the south. Other consolidations are on foot, notably in the case of the South Rand and Crown Reef, and in the region of the East Rand Extension.

The Government statistics for August show the mineral output of £2,595,497 for the month to have been made up as follows:

Gold (Rand)	£2,397,836
Gold (outside)	96,592
Silver	7,101
Coal	69,164
Other products	24,804
	£2,595,497

The minerals not specified above include copper, tin, and galena. Labor figures stand at a high level, and for the Rand alone indicate the following totals: Whites, 17,924; colored laborers, 141,896; and Chinese, 17,270. Total, 177,090. The Transvaal diamond mines employ 8942 men, white and colored; and the coal mines, 9282.

The Voorspold diamond mine in the Kroonstad district of the Orange River colony, one of the biggest and most recently discovered pipes in South Africa, is profiting by the considerable improvement in the diamond market, and has commenced washing with a new plant. The September returns show a good grade, namely, 21.08 carats per 100 loads washed.

The Premier diamond mine, of whose mining operations little has been heard for some months, owing to the policy of secrecy prompted by trade depression, appears to be making preparations rapidly for a greatly increased production. A new plant capable of treating no less than 40,000 loads (16 cu. ft.) per day will be completed about the middle of next year. With working costs already in the neighborhood of 1s. 9d. per load, the calculated profits are enormous, but in spite of the directors' confidence in their strength, it is clearly impossible to predict the effect of this vast scale of operation upon the world's market and what the attitude of De Beers will be in regard to such a competitive factor.

It is not a little surprising, in view of the ignominious collapse of tin mining in the Bushveld two years ago, to note a return to these former sites of lamentable failure. The lodes of the Bushveld Tin Mines, Ltd., are being reopened and discoveries have been made, inspiring those in control to declare that a faulty policy was adopted in the past and the system of lode occurrence misunderstood. Similarly, the property of the S. A. Lands & Exploration Co., in the Bushveld, is being re-investigated with promising results.

A question that is gaining rapidly in importance and receiving renewed attention is that of the training of artisans and engineers in South Africa. While we must admit the advisability of obtaining the best trained technical men regardless of nationality, there is urgent need for making the most of the raw material available in the country. The last meeting of the Transvaal Institute of Mechanical Engineers was devoted to the reading of a paper on this subject by the president, Professor Orr. The Professor referred to a proposal of the Government to establish a Trades School, and urged strongly that such should not be made the means of imparting closely specialized instruction in the chosen trades. He wishes to see lads given a better general education therein, supplemented by general technical instruction, leaving specialized work to the experience subsequently gained under apprenticeship in the 'shops,' connected with mines or other institutions. In this contention he gained entire support. As he pointed out, South African mines provide a most admirable place for a fitter or engineer to serve an apprenticeship, owing to the great variety of work. An ex-student of Cornell, and for some time apprenticed to the Westinghouse firm in the States, supported this view as to the special facilities for locally turning out good all-round men, without the danger commonly befalling the engineering aspirant of being put too exclusively to narrow departmental work. Following the instruction of the Trades School, there will always be the opportunity of extending theoretical and practical studies at the Transvaal University College, which caters admirably, by means of its even classes, in the higher branches of technical knowledge. Following upon a discussion of these points, the old vexed question was raised as to the possibility of giving a status to members of the engineering profession, a question which has indeed been a troublesome one in many countries. However, already in this colony land-surveying forms a closed profession. Mine-managers, resident engineers, mine-surveyors, mine-captains, and, of course, engine-drivers have to pass fairly stiff examinations for Government certificates; still, nothing prevents the humbug from practising as a consulting engineer and obtain-

ing business from the public on the strength of his own claims to qualification.

The problem presents difficulties of universal recognition. Indeed, even now and with sound cause, there is a strong opinion among men of the highest position and qualifications that the Government should modify its regulations as to the certificating of managers and foremen. Consider, for a moment, the form of the examination and its object. The subjects prescribed are mining, mine surveying, mining laws and regulations, mechanics, chemistry applied to Rand metallurgical practice, and (optional) geology, with mineralogy. Clearly, the object of the Government is to have some hold over the men responsible for the safety of the mines and to learn if those placed in control appear to be technically qualified. Assuming that dangerously incompetent men might otherwise be pitchforked into high positions (a supposition not tenable in these days of stern competition and high efficiency, as regards the Rand), such an investigation is clearly desirable. But the trouble is that it does not always serve this end and there are several notable cases of men with long practical experience, proved capable and trustworthy by the test of actual emergencies in working practice, and selected by the great mining firms as the best men available to fill positions of high responsibility, who have been 'plucked' repeatedly under the test of the Government examinations. At times, no doubt, such questioning has merely revealed a lack of knowledge of serious magnitude, but it is not right that reliable men capable of running a mine to the satisfaction of experts should be tripped by the trickeries of assay operations, of the theodolite adjustments, or dump content calculations, which the assayer or surveyor will attend to in the course of his ordinary duties.

BUTTE, MONTANA.

Copper Production in October.—Mr. Ryan's Forecast.

The estimated copper production of the Butte mines during October was 28,864,410 lb., against 29,055,000 in September and 26,121,000 in August. The Boston & Montana, Anaconda, Butte Coalition, Butte & Boston, and Washoe companies show increases, and North Butte, Original, Trenton, Parrot, and others show small decreases. The various companies contributed as follows:

Companies.	Tons of Ore.	Pounds of Copper.
Boston & Montana	99,200	7,638,400
Anaconda	119,350	7,519,050
Butte & Boston.....	20,770	1,287,740
Washoe	17,050	1,023,000
Parrot	12,710	737,180
Trenton	13,950	781,200
North Butte	41,230	3,793,160
Butte Coalition	28,551	2,284,080
Original	34,100	2,796,200
Pittsburg & Montana	6,200	496,000
Miscellaneous	6,200	508,400
Totals	399,311	28,864,410

The average yield of copper per ton of ore mined by the various companies is: Boston & Montana, 77; Anaconda, 63; Butte & Boston, 62; Washoe, 60; Parrot, 58; Trenton, 56; North Butte, 92; Butte Coalition, 80; Original, 82; Pittsburg & Montana, 80 pounds.

John D. Ryan, managing director of the Amalgamated, who is spending a short time in Butte, speaks hopefully of the future, but says better prices for the metal can not be expected until business conditions throughout the country get better. "The metal market has shown a marked improvement during the last week, and large sales of copper have been made at slightly advanced prices," he said. "The price, of course, is still quite low, and while the demand seems very good at present, general business of the country has not gotten back to anything like a normal level, and the quotations on copper probably will not show any marked advance until there is a greater recovery in all lines of trade. One very encouraging feature in the recent large sales of copper is the fact that most of the metal has been sold for domestic use. The mines are in full operation and there is no accumulation of copper. Incidentally, there is no indication that payrolls in Montana will not continue to be large and regular during the winter. In this respect I think the mining and smelting communities of Montana, in common with the lumber and agricultural centres, ought to see a prosperous year. Arrangements were made since I have been East to push the development of the water-power at Great Falls, and as many men will be given employment there during the winter as possible."

The treasurer of the North Butte Extension Copper Mining Co. has made a report to the stockholders, covering the expenditures of the Company up to the time when he was elected, on June 27. He says there was paid for the property $251,215, and for equipment and development $124,131. In addition, there is a miscellaneous account which brings the total cash expenditure up to $425,346. This amount, according to the treasurer, A. M. Andrews, represents the value of the property aside from the enhanced value resulting from the expenditures, and the opinion of those competent to judge the value of the property is that it is far in excess of the amount of money actually expended. A report from New York states that an extension of option on the Michigander and Third Sphinx has been obtained by the Company.

SALT LAKE, UTAH.

Utah Copper Railroad.—The Garfield Plants.—Pioche News. — Utah Con. Smelter.

It has been estimated that it will cost the Utah Copper Co. $1,000,000 to build its proposed railroad from Bingham to Garfield and equip it for business. Whether the line is to be built out of the general earnings of the Company or whether bonds are to be issued has not been fully determined; but it has been figured that the road ought to pay for itself within two years. As I have previously stated, the Utah Copper Co. would never have engaged in the railroad business had it not been forced to it by the Denver & Rio Grande railroad, upon which all Bingham producers have depended in the past to transport the products of their mines to mill or smelter. The latter has rendered such poor service that many have had just cause to complain, and notwithstanding that the Bingham branch is reputed to be the best paying portion of the Rio Grande system, it seems strange to a good many that the management has not been more careful to look after the interests of its patrons instead of inviting competition. Some idea of the earning capacity of the new road may be gained from the fact that the present mill of the Utah Copper Co., at Garfield, calls for 6000 tons of ore daily—and the management contemplates increasing this to 10,000 tons next year. The Boston Consolidated mill at the same place, when all the equipment is installed, will require 3000 tons per day; while the Utah Consolidated is shipping to the Garfield copper smelter at the present time 800 tons per day, upon which a freight charge of 40c. per ton is exacted by the railroad through the operation of an old contract. The Utah Copper and Boston Consolidated ore is hauled several miles farther, and the expense to these mines does not exceed 25c. per ton. But supposing the average from the three properties mentioned, to say nothing of the others in the Bingham district, was 25c. per ton, the earnings from ore freightage would run up to $2500 per day. With the road built, the Utah Copper Co. will reach out for traffic wherever it can get it.

Representatives of a large smelting company have been making overtures to the officers of the Prince Consolidated Mining Co., operating in the Pioche district, but which has its headquarters in Salt Lake. The mine contains a large deposit of iron ore of a character that is desirable. Engineers claim that 2,000,000 tons of this material, which also contains gold, silver, and lead, has been blocked out; while in separate veins a large quantity of high-grade

silver-lead ore has been developed. In addition to this, the Company owns the Bullionville tailing dump, containing approximately 171,000 tons, left from mills operated in the early days of the Pioche district. The stock was recently listed on the Salt Lake Exchange, and in the application it was stated that the Company has cash assets of $12,500 and is the possessor of 1200 acres of mineral and other lands near Pioche.

The sales on the Salt Lake Stock & Mining Exchange during the 10 months ending October 31, aggregated more than $15,000,000, which exceeds by about $1,000,000 the total sales of last year. The management has had plans drawn for a new exchange building, which is to be erected in the new financial centre of Salt Lake at a cost of about $100,000. The land upon which the structure is to stand was donated by Samuel Newhouse.

Although the operating department has released nothing confirmatory as yet, the impression prevails that instructions have been received to prepare for the construction of the proposed Utah Consolidated smelter in Tooele county. Engineers were on the ground last week. Urban H. Broughton, the president of the Company, is much in earnest about this new smelter, notwithstanding the opposition from the directors favorable to the Guggenheims or smelter trust. Mr. Broughton is quoted as having said that the Utah Consolidated mine contains a much larger tonnage of ore than it did a year ago; that its condition justifies the erection of a smelter and that unless the American Smelting management agrees to a better rate than has yet been mentioned, the construction plans will be carried out; which means the expenditure of between $2,000,000 and $3,000,000 for the purpose stated. The Company has already expended $150,000 in the purchase of land, water rights, and smoke easements.

MEXICO.

Gabriel Latour and the Monterrey Steel Works. — Zinc Properties.— News from Oaxaca.—Good Work at El Oro.

Rumor has it that Gabriel Latour, who is so heavily interested in the coal and iron fields of Alabama, is on his way to Mexico, and will examine into the affairs of the Monterrey Iron & Steel Co., with the idea perhaps of taking it over, or at least obtaining control of it, and possibly merging it with his interests in the States, which comprise the Osceola Iron & Coal Co., and the Alabama Consolidated Coal Co. It certainly is to be hoped for the good of Monterrey and its steel works that the rumor may be founded on fact, for ever since the start, the Monterrey company has needed some one who thoroughly understood the business. In the zinc circles of Monterrey also there seems to be a light awakening of interest; the more important movements in which being the purchase by the Empire Zinc Co. of the Peñascosa mine and dump, situated near the Fierro station in the State of Coahuila; and the acquiring of control by Pablo de los Santos, of Sabinas Hidalgo, in the Cruz del Aire mine near Sabinas Hidalgo, which from a little lead prospect four years ago has developed into such an excellent lead and zinc producer that De los Santos paid ₱174,000 for 620 of the total 1200 shares. De los Santos is also heavily interested in a number of other lead and zinc properties in this district.

From many other parts of Mexico come even more favorable reports, which may or may not be in part the result of the elimination of the famous Article 144 of the new mining law. In Oaxaca, to which the larger smelters have paid but little attention, it having been looked upon as territory for the Teziutlan Copper Co. and independent ore-buyers, both the San Luis Potosí smelter and the Monterrey plant of the A. S. & R. Co. have had representatives in the field during the last month and it would appear as though they were endeavoring to contract all available ore before the Oaxaca Smelting & Refining Co. begins the purchasing of ore for its Oaxaca smelter, which H. M. Holbrook is quoted as saying will blow in as soon as possible after January 1, 1909. The Santa Catarina, controlled by Boston capital and in charge of Arthur Buttner, has 10 additional stamps engaged in experimenting on the further treatment of the ore and without much doubt a cyanide plant will be added shortly. On the Socorro Mining Co.'s property in the Nochistlan district orders have been given and construction work started for a 10-stamp mill. The Navidad Co. is erecting its new cyanide mill under the superintendence of W. B. Washington. And the Santa Sofia Mining & Milling Co., also of Oaxaca, expects to begin the erection of its 100-ton mill about the first of the year. In the San José district work has been started on the Gold King. English engineers are examining the Natividad, and examinations are also being made on the Zapote. In the Ejutla district a deal is on for the San Francisco and H. B. Hall has taken an option on the Hortoncillo. In Tlalcolula, the Marina & Anexas Co. is preparing to resume operations, and an 8 kilometre tramway has been ordered for the Montes Exploration Co. of Tamellin. At the Guadalupe, near the Ocotes of the Teziutlan Copper Co., in the Ejutla district, which was bought from Messrs. Fuoss and Houston early in the year by Otto Mahrmund (of San Antonio, Texas) and H. Greisdick (of St. Louis, Mo.) a good grade of silver-bearing copper ore (30 oz. silver and 8 to 10% copper) has been cut on the 300-ft. level.

In the El Oro district of the State of Mexico, the four principal producers, the Dos Estrellas, Experanza, El Oro, and the Mexico, show a total production of over ₱9,000,000, with an expenditure slightly in excess of ₱5,000,000, so there was left a profit of ₱4,030,100, their rank as producers being in the order named. The Mexican mines of El Oro shows for a twelvemonth a production of 65,000 tons, with a profit of ₱132,897, the total expenses being ₱6.33 per ton produced, and the company reports as blocked 205,310 tons running ¼ oz. of gold and 6½ oz. of silver. The Somera has cut a 4-ft. vein assaying ₱40 per ton 150 ft. west of its Patricio shaft; and a rich gold and silver strike is also reported from Los Ocotes Mining & Milling Co., of Tlalpujahua. The Victoria y Anexas continues cross-cutting in search of the several veins crossing the property. In Zacualpam, Mexico, the La Cuchara Co. is opening up a large body of lead and zinc ore and a large concentrating plant has been ordered.

KALGOORLIE, WESTERN AUSTRALIA.

Chaffers Stock-Boom. — Unique Head-Frame. — Cassel Process at Oroya-Brownhill. — New Agitator and Slime-Filter at Associated Mine.—August Production.

There has been rather a boom in Chaffers stock during the month, due to tributors striking rich ore near the surface, and having crushed a rather high tonnage. This mine is on the south end of the Horseshoe, and, of course, has great possibilities. Scrip rose to a high price, and there is no doubt that the mine was absurdly overvalued, but speculators do not trouble to look into that side of the question.

At Edwards' shaft, on the Great Boulder, the new headframe will be finished before this is in print. The legs are built of sections of steel piping, about 10 in. diam., and braced together with I beams, the whole standing on massive concrete foundations well above the ground. The height will be about 95 ft. This is a new idea, as the other head-frames on the field, in the majority of cases, are from jarrah trees cut in the southwest part of the State. Sticks 100 ft. long, with a 30-in. base and 10-in. top, may be procured for this purpose. The largest set of steel legs, made up of angle iron and lattice work, are on the Great Fingall, in the Murchison. The Babcock & Wilcox boilers for the hoist at Edwards' shaft on the Boulder are being built in, while the foundations for the hoist itself are being laid. When finished, this will be a powerful hoisting station.

After several months' trial of the Cassel process on its residue heap, the Oroya-Brownhill Co. has bought a plant near by, will enlarge it, and start treating 15,000 tons or more monthly. It is perhaps just as well that a start is

to be made on this enormous pile of stuff, as the boom distributor on top is now becoming a trifle unwieldy to handle. The new Edwards' duplex roaster at the Associated is almost finished. It is to be driven by a 15-hp. motor. This company generates its own power for lighting, various motors, and an electric hoist at Tetley's shaft, on the Ilgner system, so well known in Germany. The duplex furnace on the Boulder should also soon be at work, while Moss' Gold Recovery works are about to erect one of the same type.

For some time past the Associated has been experimenting with the A. T. agitator on its roasted ore, as it comes ground to slime from the pans and settlers. The vats here are of steel, about 16 by 6 ft., and the A. T. machine is driven at 60 rev. per min., taking 10 to 12 hp. Previously, the agitation of the slime by the ordinary vertical spindle with long arms attached took 20 hr. Now the A. T. machine does the work in about 3 hr., with a slightly better extraction, especially so if the roast has been at all poor. The ordinary type of agitator takes about 3 hp. The Associated has three A. T. machines at work, is installing two more, and then hopes to put all the old machines out of commission. A new slime-filtered machine has also been evolved at this mine by one of the mill foremen. It consists of a wide belt and cloth, on which the agitated pulp is run; the belt is then squeezed between rollers, and the solution runs through the filter cloth and the holes punched in the belt. The model works well enough, but the squeezing of the belt will tend to crack it in time. A working machine is now being constructed. It is thought that two or three machines in series should wash the pulp thoroughly, the work being continuous. The August outputs from the principal mines were as follows:

Name.	Tonnage.	Value of Output.	Profit per Month.
Associated	10,432	$112,000	$ 37,000
Associated Northern	3,737	40,000	16,000
Golden Horseshoe	24,924	255,000	110,000
Great Boulder Proprietary	16,683	247,000	125,000
Great B'lder Perseverance	18,002	130,000	30,000
Great Fingall	22,234	135,000	25,000
Hainault	6,841	29,500	1,100
Ivanhoe	19,637	205,000	105,000
Kalgurli	11,060	151,000	82,000
Kalgurli South	9,033	61,000	10,000
Lake View Consols	8,541	50,000	*12,000
Oroya-Brownhill	11,906	80,000	20,000
Oroya-Black Range	4,401	55,000	21,000
Sons of Gwalia	13,002	91,000	25,000
Sons of Gwalia South	2,005	21,000	9,500

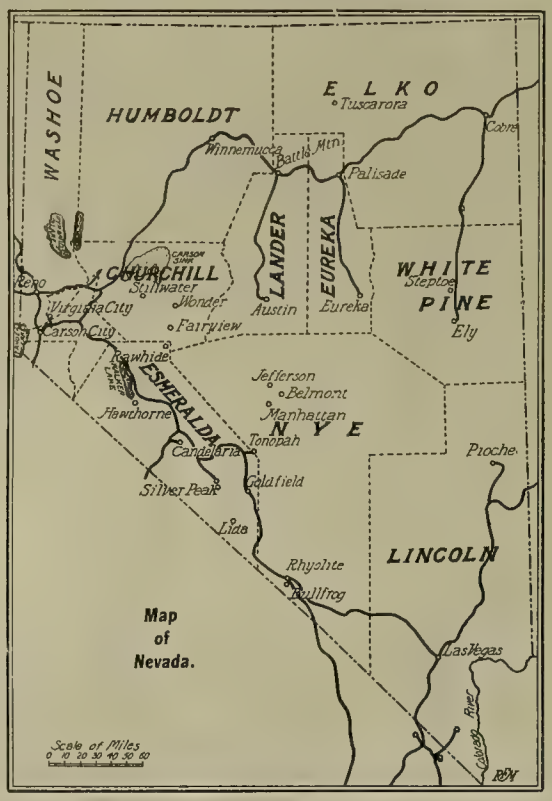
*Half of this profit is from the re-treatment of old residue.

CHAFEY, NEVADA.

A New Camp.—Dun Glen and Sierra.—Early Mining.—Story of Discovery.—Ore Shipments.—Geologic Conditions.

During the past summer the old mining camp of Dun Glen, in Humboldt county, Nevada, has experienced a notable revival, and, under the new name Chafey, has attracted no little attention among the mining men of that State. This new-old camp is situated on the west slope of the East range of mountains, and lies mainly within Township 32 North, Range 36 East. From Winnemucca, the county seat of Humboldt county, it is distant 20 miles in a southwesterly direction, and from Mill City 10 miles southeasterly, both being stations on the Southern Pacific railroad. From these towns stages and automobiles run to and from Chafey.

Chafey is the usual aggregation of a few frame buildings and many tents. All lines of business are plentifully represented. Its proximity to a railroad has kept living expenses down to reasonable figures from the start. Meals cost from 35 to 50 cents, beds from 50 cents to $1. Numerous small springs furnish good water, but the supply is quite limited. Wood, such as juniper and sagebrush, covers the near-by hills in fair quantity. The present population is close to 500, of whom not a few are unable to find work. The Tonopah scale of $4 per day has been adopted, but it would be futile for miners to go there seeking employment. In fact, until the mines have had another year for development, those now present are all that could properly be employed in the legitimate industries of the place. The first gold discoveries were made more than 40 years ago, when prospectors from Unionville, in the Humboldt range, crossed the valley to the east and in the East range discovered the mines that called into existence the camp of Dun Glen. These pioneers organized a district, called by them Sierra, and this name still endures. At this time Unionville was the most important town in central Nevada. The principal ore-reductiou plant of that region was operated there; Raymond, of Raymond & Ely fame, was driving into the bonanzas of the Arizona mine, and the mining and financial activities of Humboldt county centred there. Mark



Twain, as yet unawakened to the quickening of his own genius, was an obscure resident of the place, and the graybeard survivors of those days tell many yarns of him, of which Mark is not always the hero. The first ore brought to Unionville from the Sierra district prospects was the typical surface ore of most gold veins, a rusty, cellular, disintegrating quartz, with much visible gold. As this ore was found in many places over a considerable area, and throughout a series of several related veins, a stampede occurred upon the facts becoming known, and the camp of Dun Glen came into being. While its growth was neither rapid nor great, Dun Glen eventually grew to be a settlement of some few hundreds, and ranked next to Unionville in importance, at one time being a garrisoned military post, with a company of regulars. As the mines developed and increased in number, mills were built, and over half a million in gold was obtained from the mines of Monroe Hill, from the Auburn, the Auld Lang Syne, and other properties. Later, Dun Glen repeated the history of all mining camps, ancient or modern. As depth was attained both the character and value of the ore changed. The oxidized ore above the adit-levels was stoped and sulphides in quantity were found. Pyrite, chalcopyrite, arsenopyrite, galena, and sphalerite

perplexed the millmen, and vanners were added to the equipment, but decreased extraction and increased cost proved a heavy handicap. Finally, the Monroe Hill vein was found to be faulted, and was not recovered. The Auld Lang Syne stoped all ground above the lower adit and then gave up the fight rather than sink below water-level, notwithstanding the fact that the vein was still regular and undiminished in size, carrying gold associated with sulphides. The operation of the smaller properties of the district had previously ceased, and with the closing of the Auld Lang Syne, lode mining in Sierra district came to an end. It is true that small bunches of ore were occasionally taken from the veins of Monroe Hill and worked by an old Cornish miner of the name of Hendra, but this desultory work was not mining. Hendra had come into possession of the Monroe Hill and other mines, and one of the mills, and until his death, a few years ago, made a comfortable living in this manner.

During the year 1905 Hendra's widow and his daughter, owners of the property, gave long-time options upon the Hendra group to Henry W. Kent, of Milwaukee, $10,000 being the purchase price. Kent organized the American Finance Co. and sold stock. As a stock salesman he was probably a success, but as a mine manager he distinguished himself simply by the facility with which he was able to fritter away other people's money, and therefore accomplished little in the way of development. However, in the little work done by Kent under his option we find the initial cause of which the camp of Chafey is an effect. Into a soil-covered hillside, devoid of quartz outcrop, or other indication, hundreds of feet away from the nearest mine-working of early days, Kent drove a cross-cut to intercept the lode. Within 25 ft. the vein was reached, and a drift was soon in quartz that sampled nearly $100 across 4 ft.; and there the drift stopped, for Kent would not permit any more work at that point, and did practically nothing at any other. Kent's option expired by limitation in the spring of the present year, whereupon a new bond was at once obtained by Charles Harlowe, at the advanced price of $30,000. Harlowe had invested several thousand dollars in the Kent enterprise, all of which would be a total loss unless he could find a purchaser for the property.

At this juncture Harlowe made the acquaintance of E. S. Chafey. Chafey is a hustling youngster from Kansas. He first came into the limelight in Nevada through his having made a modest fortune by the sale of his interest in the Transvaal claim in the Bullfrog district, a so-called gold mine that does not produce gold. Later, he is said to have made another good sale at Greenwater. After Chafey saw the Hendra property and sampled the ore Kent had exposed, he was not slow to realize that here, at last, was a real opportunity, and he thereupon undertook to raise the money necessary to handle Harlowe's option. Securing the financial assistance of a San Francisco friend, Chafey began operations in a small way, but with shipping ore to start on and only 10 miles to railroad, it was not a difficult matter to make the property pay its way. The first shipments are said to have netted $100 per ton. Since June, from 1200 to 1500 tons have been shipped, but there is no way of learning the value of this ore, since the management has refrained from giving authentic figures. Camp gossip and the statements of the local press to the effect that the total has averaged in excess of $100 per ton, net, need not be given serious consideration. That the shipments have been extremely profitable is not to be doubted, for the reason that prior to the last of September Chafey was able to make full payment of the purchase price of the property from the proceeds of ore shipped. In addition to ore sent to samplers and smelters, an equal tonnage has been worked in camp at the old Hendra mill. This ore is said to average $20 per ton, gold. Silver and lead are contained in the ore, but in too small amount to be of economic importance, even in the shipping grade. The mill is antiquated and contains a battery of three light stamps and a 5-ft. Huntington. Under favorable conditions the output is 30 tons per day, but a limited water-supply and intermittent coal-receipts often lessen the tonnage treated. A two-stamp, gasoline-driven mill has lately been erected by other parties, but its small capacity eliminates it from consideration as a factor in treating the ores of the camp.

Sierra district, as organized by the pioneers, is a large one. I did not cover it fully, nor do I know its exact boundaries, hence can do no more than generalize with regard to the local geologic conditions. In such portions as came under my notice—particularly those parts wherein the mines are situated—the general condition was that of extensive areas of the older sedimentaries (limestone and slate, and occasionally impure quartzite thinly interbedded with the slate), penetrated by a broad belt of intrusive rock. It is my belief that by far the greater portion of this belt is andesite, but I do not feel satisfied to attempt to pass upon this question of identity from mere field inspection. Possibly a determination would place this rock with the rhyolites, and in some parts of the eruptive area rhyolite is unmistakably in evidence. Wherever observed, the andesite has been much altered and has received abundant additions of silica. In consequence, it has resisted the weathering attacks of the elements and is characterized by rugged outcrops that stand out in bold relief. Having a width of fully half a mile by not less than four miles in length, and crossing the East range diagonally from valley to valley with a strike nearly north, this andesite belt has much the appearance of a huge dike. In several places, but confined to small areas near the veins, a schistose structure was observed, but it does not warrant the misuse of 'schist,' as the rock is locally called. Near its western limit several narrow dikes occur, intrusive within the andesite. Their course is nearly north, their width usually under six feet. The mines of Monroe Hill are found at or near the contacts. Of the contact veins observed, basalt was in all cases the hanging wall. The other veins are wholly in andesite. Apparently the same minerals are common to both classes of veins. A mile farther north, on the Auld Lang Syne property, the dikes appear to have converged, since but one is visible and that one having a width of 30 ft. Here only one well defined vein is found; course, north; dip, east, at 70°; width, 4 to 7 ft. Basalt forms the hanging wall, and andesite the foot. The hanging wall shows no alteration other than that due to weathering, but the foot-wall gives evidence of excessive chemical action. As much as 60 ft. in width, adjacent to the vein, has been altered by the same silica-bearing solutions that formed the lode proper, and where quartz-replacement of the porphyry has not been completed the porphyry has been so highly silicified as to destroy all original crystallization. Gold is contained in the more quartzose portions, but not sufficient to make of the mass a profitable ore. Many small veins outcrop within the slates, but no valuable minerals were observed in any veins apart from the eruptive rocks. The limestone to the west and northwest will warrant close prospecting.

There is reason to believe that large bodies of low-grade gold-bearing sulphide ore will be found at depth throughout Sierra district, and the future prosperity of Chafey is likely to depend upon treating this ore in such quantity and by such method as to show a profit on millstuff running $10 per ton. Good management can accomplish this result, but any effort to establish the camp upon a stock-board foundation will be certain to bring failure, and naught but failure will follow, even with the best of intentions, unless men competent to apply the cost-reducing methods of modern mining are placed at the helm. High-grade ore will be found from time to time, but when the law of average begins to operate it will be evident that the margin of profit is such as to demand constant attention to all the little economies that tend toward a minimum cost-sheet.

The rejuvenation of this old camp is one of the important events of a lean year in Nevada. It is to be hoped that those who direct its future will appreciate both their opportunity and responsibility, and that they will be able to develop profitable mines—and a mining camp untainted by those methods of illegitimate mining for which Nevada has become notorious.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Amalgam loss by abrasion in treating a gold ore in an arrastre is undoubtedly due to keeping the amalgam too hard. The use of more mercury should remove the difficulty. The temperature of the water has no appreciable effect in softening or hardening amalgam except when steam or frost is involved.

Machinery paste said to possess superior qualities as a protector from oxidation is made by melting camphor in lard, in the proportion of 1 to 16 by weight. The mixture may be stiffened by the addition of ground graphite. The metallic surface must be thoroughly cleansed before applying the paste.

Blue-prints which have been over-exposed may be strengthened by applying a dilute solution of hydrogen peroxide. A print of deep blue color and clear lines will result. A solution containing 1 c.c. of peroxide to 50 c.c. of water is of proper strength. Some operators purposely over-expose and then tone up the prints with the peroxide.

Stockholders of record in a mining company organized under the laws of Arizona have no right to demand a statement from the company's officers as to the affairs of the corporation, but they do possess the right of personally inspecting the company's books. Their right to inspect the mines and works of the company will be governed by the laws of the State or country in which the properties are situated.

Annual labor performed upon one claim of a group only, in order to apply within the intent of the law as at present determined, requires that the claims must be contiguous, but not necessarily located upon a single lode or vein, and that the group of claims be held in common ownership, and further, that the work done upon the one claim tend to develop the vein or the entire system of veins covered by the group.

Gilsonite, more properly called uintaite, is mined by open-cut methods, being easily broken by the pick. It can not be blasted. We know of no application of mechanical excavators to this work, but we see no reason why some adaptation of the endless chain of buckets, after the 'trench digger' type, might not be advantageously employed. Most of the gilsonite fissures in Utah stand nearly vertical, thus favoring mechanical methods of excavation.

Cylinder oil in air-compressors undergoes partial combustion to carbon monoxide, owing to the high temperature produced in the cylinder, which ranges from 350 to 450° F. This gas, if produced in large quantities, so as to become mixed in the proportion of about 1 part of carbon monoxide to 2½ parts of air, is highly explosive. The gas is also poisonous, and the atmosphere in narrow working-places where air-drills are used, is sometimes rendered injurious from this cause. The remedy is to use a high-grade cylinder oil which is non-volatile and resistant to combustion at the temperature of the compressor cylinder.

Simpson's one-third rule as stated in our issue of September 12 was in error, and should have read as follows: Divide the base line into an even number of equal parts and erect ordinates at the points of division; then add together the first and last ordinates, twice the sum of all the other odd ordinates, and four times the sum of all the even ordinates; multiply the sum by one-third of the common distance between ordinates. This rule gives the area of an irregular tract, if the position of the base line is properly selected, or it may be advisable to inscribe a triangle or series of triangles in the area and use their sides as base lines.

An arrastre clean-up is made by grinding down the last charge, with excess of feed-water, until the 'drag' is running on the bare pavement. The pavement is then taken up, each block being washed into a tub, and inspected for adhering amalgam. The remaining pulp is removed, and the 'puddle-bottom' scraped. This pulp is panned down carefully to black sand and amalgam. The pannings are rubbed down with fresh mercury, the black sand floated off, and the dilute amalgam squeezed in canvas or chamois skin in the usual way. The 'puddle-bottom' should be carefully inspected, and repaired with fresh, well kneaded clay, to prevent escape of mercury and amalgam, before the pavement is replaced.

Infusorial earth is used chiefly as a polish-powder. It is of small commercial value on account of being restricted to local markets, where saving in freight will enable it to compete with the 'volcanic dust' from Nebraska. Immense beds of volcanic dust are worked on a large scale in that State, giving the operators a practical monopoly of the business. An infusorial earth of superior purity, and containing no admixture of clay, might find a market as a 'dope' for dynamite. On account of its micro-cellular structure it is the ideal absorbent for nitroglycerine. It is used abroad for that purpose, but no suitable deposits have so far become known in America.

Sea-waterproof cement, bearing the name 'Aegir,' is a product of a cement works at Hemmoor, Germany, which it is claimed can be used with economy and efficiency for works constructed in sea-water, tunnels, and other places, where ordinary portland cement will deteriorate. The raw materials used in its manufacture are: chalk containing 99½ to 100% of pure carbonate of lime; roasted quartz, very finely ground; and finely ground ferric oxide. The ferric oxide is obtained partly from bog-iron ore and from other purer iron ores. After the quartz and ferric oxide have been finely ground, all the three materials are worked together into a moist paste. After having been dried the mixture is burned to clinker in the ordinary way. In other words, it is a cement in which iron oxide replaces the alumina.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Decline and Revival of Comstock Mining.

The Editor:

Sir—I have read the articles by Mr. Whitman Symmes with much interest. My own knowledge of local conditions prompts me to offer the following comment:

The work of the Comstock Pumping Association, formed in 1898 to unwater the Comstock lode at Virginia City, Nevada, is, after years of trying labor, beginning to be rewarded with results in the north-end mines. During the past few years an extensive body of ore has been mined on the Ophir between the 1800 and 2200-ft. levels. Within the past month ore in the Con-Virginia has been found on the 2150-ft. level lying between drifts previously run and the foot-wall of the lode; and in the Mexican, ore has been found by driving north from the 2200-ft. level of the Ophir. These mines adjoin each other, and were fairly well prospected 25 years ago on the levels where ore is now being found. The policy of the management at that period was to abandon the upper levels and to scatter development work between the 2500 and 3100-ft. levels; this has proved a mistake. It may take another 25 years of prospecting to prove or disprove the existence of ore in paying quantity, and to mine what is known to exist above 3250 ft., the vertical depth of the Combination shaft. To understand the reason, the following observations are made: The Comstock lode is from 100 to 250 ft. wide for the length of the main stem (without the branches), that is, for a distance of about 11,000 ft. Of the 20 principal companies that have operated on the main stem, all but two or three have had bonanza orebodies within their respective boundaries at some stage of their development. Some have had both a shallow (down to 500 ft.) and a deep (below 1500 ft.) bonanza. For the present, only the north-end properties, that is, those lying north of the Best & Belcher, are in a position to profit by the unwatering of the lode as far as it has gone; it will take several years for the remaining properties to be similarly benefitted. The great extent of the lode, combined with the inability of the non-producing mines to collect assessments for work on a large scale, the lack of concerted action among the property owners, and the physical conditions under which work must be performed are some of the contributing causes why it will take many years thoroughly to explore the ground.

The late discovery of ore at the point where active prospecting was resumed when the water receded draws attention once more to the most remarkable body of ore taken from the lode, namely, the bonanza of the Consolidated Virginia and the California mines. This prompts speculation upon the possibility of opening a similar ore-shoot either within the same property or elsewhere on the lode.

At the time the big bonanza was first worked, the two companies were separate corporations, though practically under the same management. The Consolidated Virginia claim was 710 ft. long, and the California 600 ft., making in all 1310 linear feet of the lode. The two companies were consolidated in 1884; the corporation is known as the Con. Virginia Mining Co. Since the bonanza lay in several closely connected lenses between the two claims, and even extended into the Ophir, it will be treated and discussed as one orebody.

During the year 1877, at the height of production, 356,883 tons, with an average assay-value of $127.52 per ton, were hoisted through the two shafts, or about 1000 tons per day for the period. A careful compilation, made by the writer, from data taken from the annual reports of the superintendents for each year up to 1882 has been made of the product of the big bonanza, and is presented herewith graphically; likewise the production of the mine from 1885 to 1903, or during the period when it was supposed to have been worked out, was compiled from the official records and is shown in a similar manner. The dividend line of the latter period is omitted, the total figure only being given, owing to the difficulty of obtaining the extended figures.

Statistics are generally uninteresting, but the above summary of the production of the remarkable body of ore cannot fail to attract the interest of mine managers and engineers of today; they are given without apologies.

Eighty-four per cent of the product came from the first workings, or before the mine took fire in 1881, and 16% from the surrounding lower-grade ores, but principally from beneath the bonanza. Since the price of silver was near its coinage value during the

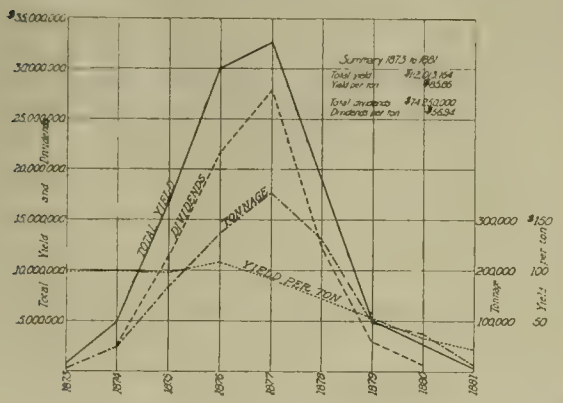
Period.	Tonnage.	Gross yield.	Yield per ton.	Probable assay value per ton.	Dividends.	Dividends per ton.	Assessments.	Dividends less assessments per ton.	Dividends less assessments per ton.
1873 to 1882..	1,304,478	$112,013,164	$85.86	$119.25	$74,250,000	$56.94	$1,176,300 (1859 to 1884)	$0.90	$56.04
1885 to 1903..	914,397	21,458,508	23.46	29.32	3,963,600	4.33	1,635,347 (1885 to 1907)	1.78	2.55
1873 to 1903..	2,218,875	133,471,672*	60.15	83.54†	78,213,600	35.25	2,811,647	1.25	34.00

*Gold 47%, silver 53%; silver at $1.2929 per ounce.

†Production, $185,377,322.

greater part of the time while this 84% was being produced, the actual returns in money from the mines were close to its gross yield. The assessments levied have been heaviest during recent years, and the larger portion of the money has gone to the Pumping Association, in payment of each mine's share of the expense of unwatering the lode. The work of the Association on the north end has been concentrated at the C. & C. shaft. The mine had no ore until 1873, the vein within the boundaries of the two claims having 'pinched out' in the vicinity of the 1200-ft. level; hence the early assessments.

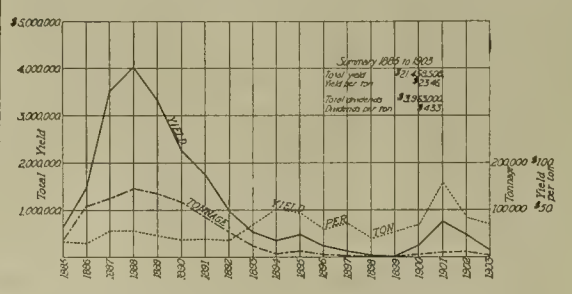
On examining the table it is seen that, subtracting the net dividend from the yield per ton gives a cost of $29.82 per ton for the first period, and $20.91 per ton for the second period, which figures include mining, exploration, ore-treatment, equipment, management, and fixed charges. This seems excessive, but there were extraordinary physical difficulties to



Production of the Bonanza Orebody Con. Virginia and California Mines 1873-1881.

overcome in conducting the work, difficulties that are not encountered in mining smaller veins. The mine-workings of the Comstock are notorious as being the hottest in the world. The mine-waters from the lower depths vary in temperature between 130 and 160° F. Careful observations, covering a period of years, show that the temperature of the lode increases 1° for every 33 ft. in vertical depth. Where rapid production of ore is in progress, such as usually attends the mining of a bonanza, wasteful methods prevail; economical conditions are hard to maintain. The consumption of mine timber was nearly 5,000,000 board feet annually, costing from $25 to $30 per thousand. Milling charges for ore treatment varied from $13 in earlier years to $9 later. In the Comstock mines a great supply of fresh air must be directed against all working faces; the plenum and the vacuum systems are generally used together in depth. As much as 1000 tons of ice were consumed in one year for ice-water underground. Tubs of it are kept at stations and at all resting places for the miners. The labor-efficiency depends, not so much upon the personal equation of the miner, as upon the efficiency of the management in providing air and water. Debilitating as excessive heat may be to most men, there is not to be found a finer and healthier lot of miners anywhere than those on the Comstock; it is a noticeable feature of the district.

For a correct appreciation of the bonanza as it appeared while being worked, there is no better source of information than the report of the superintendent, James G. Fair, in his annual report to the directors, dated December 31, 1875. Its terseness and brevity when dealing with such large figures and important facts commend it to superintendents of today. What is copied here is taken verbatim. He said, in part: "During the past year, 169,307 $^{402}/_{2000}$ tons of ore have been extracted from all the levels of the Consolidated Virginia Mine, and 169,094 $^{1806}/_{2000}$ tons have been reduced, which yielded $16,731,653.43 in bullion. There are now in the ore-house and at the mills 2988 $^{194}/_{2000}$ tons, valued by asay at $478,080. This ore has been taken from the 1200, 1300, 1400, and 1500-ft. levels, including a small quantity which has been gathered in the explorations which have been made on the 1550-ft. level. On the 1200 and 1300-ft. levels the orebodies have not been developed as far as they extend north. On the 1400-ft. level the ore has been explored south 450 ft. from the shaft (meaning the Con. Virginia



Production of the Con. Virginia Mine 1885-1903.

shaft), and it extends north from the shaft to the northern boundary of the mine. On this level we know the exact width of the orebody. On the 1500-ft. level the ore has been traced south for a distance of 480 ft. from the northern line, and has been thoroughly explored by cross-cuts from the east to the west wall. On this level, all the ore is of a high grade, and the width of the body varies from 150 to 320 ft. The ground south of this is entirely unexplored. On the 1550-ft. level, a lateral drift extends the whole length of the mine. Starting at the southern boundary, it runs northerly on the east side of the ore until it reaches a point 400 ft. distant from the northern line, where it cuts through the clay, and thence passes all the way through ore to the northern line. This level is only partly developed. None of the cross-cuts have yet reached the eastern boundary of the ore. The ore on this level is of a better quality than that which has been found on any of the levels above. Its width, I have no doubt, will prove greater. At a point 320 ft. south of the northern line, a double winze has been sunk from this (1550-ft.) level to a depth of 147 ft. This winze has passed all the way through ore of a very high grade, and terminates in ore of the same quality. The sinking of the winze has been temporarily discontinued on account of the increase of water and

our limited means for hoisting. From this level, north of the northern line (meaning in the ground of the California mine, which was just being opened) another double winze has been sunk to a depth of 128 ft., through excellent ore the entire distance, and terminates in rich ore. The developments made by these winzes proves the continuity at these lower depths of the same orebody which exists on the level above, with an appreciation in the quality of the ore."

When Fair spoke of ore "of a high grade," he spoke advisedly, for the succeeding year showed a production of 145,466 tons yielding $114.50 per ton, or $16,657,649, from the Consolidated Virginia, and 127,540 tons, yielding $105.07 per ton, or $13,400,845, from the California, or a combined yield of $30,058,595, out of which $21,600,000 was paid in dividends. The production reached its zenith a year later, in 1877, from the same ore "of a high grade."

J. H. G. Wolf.

San Francisco, October 17.

Mechanical Loss in Slime Filtration.

The Editor:

Sir—I would be obliged if some of your readers would give some information regarding the mechanical loss of cyanide incurred in operating such slime filters as the Moore, Butters, Kelly, or Burt. By 'mechanical loss' I mean not merely the amount of cyanide retained in the cakes when discharged from the filter, but the total quantity of cyanide used per ton of slime treated, in excess of that which is required to replace the loss due to chemical decomposition. I fully realize the difficulty of generalizing on a subject into which enter so many varying factors, but it may be that some metallurgists who have had an opportunity of operating such slime filters over a considerable period may have in their possession data showing the amount of cyanide consumption attributable to this cause; in which case, I hope that they will let us have the benefit of their experience.

Rivers R. Baildon.

Puebla, Mexico, October 25.

[Among our readers are superintendents able to furnish this information. We hope they will do so, for it is a matter of general interest to those engaged in cyanidation.—Editor.]

Refraction.

The Editor:

Sir—Your note, under 'Concentrates,' upon this subject, in your issue of September 26, illustrates an ingenious method for determining, in the field with an engineer's transit, the correction for the refraction of the sun with an error which is within the limits of the graduation of the usual field instrument.

I believe that the method I have used for several years for direct observation of the sun is much simpler and more exact, as the errors under normal conditions of observation will rarely exceed two seconds, while ordinarily the error is only a fraction of a second. The formula is as follows: The correction, in seconds, for the normal refraction of the sun is equal to 58 times the cotangent of the observed altitude of the sun's centre. Example: the observed altitude of the sun's centre was found to be 18° 40′. What is the correction for refraction?

Log. cot. 18° 40′	= 0.47130
Log. 58	= 1.76343
Log. 171.7″ (0° 2′ 51.7″)	= 2.23473

In this instance we have an error of plus 0.9 of one second.

This formula refers to normal conditions of the atmosphere, at sea-level and a temperature of 50°F. However exact the formula may be, this of itself is of little importance when other important factors are neglected. The factor I especially refer to is the elevation above sea-level at which the observations are taken. At an elevation of 6000 ft., other conditions remaining normal, the refraction will be 81%, and at 11,000 ft. only about 66% of what the refraction would be at sea-level. The neglect of this correction when surveying at high altitudes may, under certain conditions, cause an error of several minutes in azimuth and latitude determinations. The corrections for temperature can be neglected in all ordinary field work.

G. E. Kedzie.

Durango, Mexico, October 4.

Corporation Gratitude.

The Editor:

Sir—In your issue of October 24 is a notice of the report of the Tomboy Mines Co., and it is mentioned that a bonus of 1% of the 1907 profits was paid to the former manager, Mr. John Herron. This is an instance where a corporation has not proved ungrateful. The company is deriving its present profits from ground which Mr. Herron had the opportunity to acquire for his own account, but, without being bound in any way to do so, he turned it over to his employers at no advance in price. It is good to see such an action duly appreciated.

Francis Drake.

San Francisco, October 26.

Spelling Reform.

The Editor:

Sir—I am sending herewith a copy of a letter which may interest you. The spelling in particular is utterly absurd, "thru" and "cheque," the ultromodern and the antique, both on the same page, rather tend to throw a shadow over the imposing letter-head.

If these are the lines along which they hope to advance science, I cannot feel justified in sending them my "cheque" for three dollars.

Yours very truly,

Member A. I. M. C.

New York, October 28.

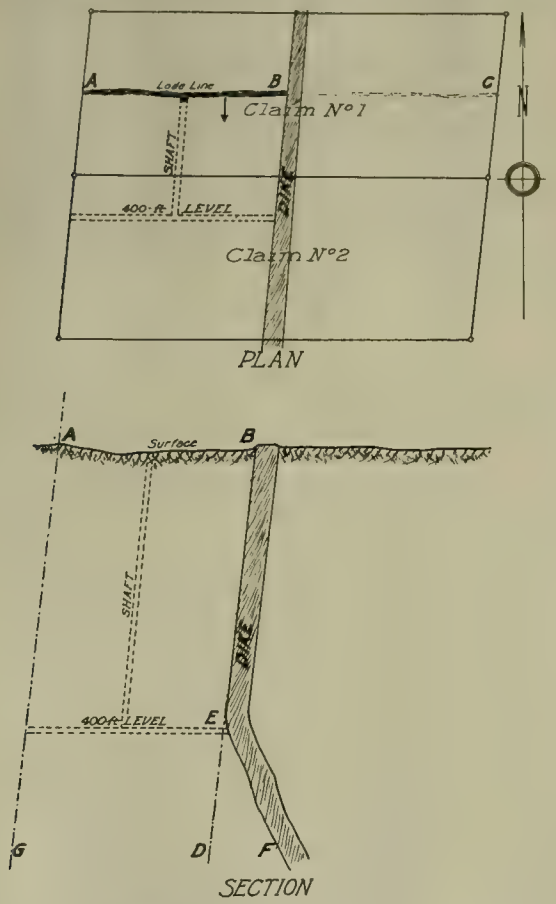
[It is not necessary to reproduce the letter mentioned above, but a reference to the subject will be found on the editorial page.—Editor.]

BLIND APEX.

The following problem in mining law has been submitted to us:

Given a claim with the outcropping lode-line A B running west from a dike, which cuts off the vein at B. The vein dips a trifle to the west of south, so that the 400-ft. level exists vertically under claim No. 2. The dike dips westwardly to the 400-ft. level, at which point it turns sharply toward the east, as shown in the section.

The rights to that portion of the vein lying to the east of the dike would be determined as follows: If the apex or outcrop of a vein can be traced in claim No. 1 from B to C, and if it can be shown to be the



same vein which apexes from A to B, even though its continuity be broken by the dike, the owner of claim No. 1 would be entitled to all of the vein on both sides of the dike that would be embraced between vertical planes passed through the parallel end-lines of claim No. 1 and extended indefinitely in a southerly direction. This would embrace the segment of the vein designated as D E F on the section, as well as all other segments lying between the end-line planes. However, if no apex is found in claim No. 1 so situated as to extend the extra-lateral right of claim No. 1 to the east of the point B, the extra-laterial rights of claim No. 1 would be measured by a vertical plane A G passed through its westerly end-line, and another vertical plane B D passed through B and parallel to A G. The owner of claim No. 1 would be entitled to all that portion of the vein lying between these planes prolonged southerly. Under these circumstances, the owner of claim No. 2 would be entitled to the segment D E F, and, in fact, to any segment of the vein that existed to the east of the plane B D and that was also vertically beneath the surface of claim No. 2. The terminal edge E F would, under these circumstances, constitute a 'blind' apex, which might give extra-lateral rights to claim No. 2, if it were located so as properly to include the apex E F.

Limestone is used for furnace flux in amounts almost equal to its larger application in the form of crushed stone. The value of the material used for this purpose in 1907 amounted to $9,144,489, as against $7,612,692 in 1906, an increase of $1,531,797. These figures represent outputs of 17,119,297 long tons in 1907, and 16,077,202 in 1906, a gain in the latter year of 1,042,095 long tons. The average value per ton increased from 47c. in 1906 to 53c. in 1907, the increase in price, according to the dealers, being due to increased cost of production. Limestone used for building purposes, including rough and dressed stone, sold by the producers, was valued in 1907 at $4,580,226, as against $5,098,631 in 1906, a decrease of $518,405. Indiana ranks first in the production of limestone for this purpose, with an output valued at $2,378,008, or 51.92% of the total building limestone for 1907. The State second in rank in 1907 was Missouri, with an output valued at $538,114. The value of the limestone used in the United States in 1907 for miscellaneous purposes was $1,324,601, this classification including stone quarried and used by alkali works in New York and Michigan in the manufacture of soda ash salts; stone sold to glass factories in Pennsylvania, Ohio, Missouri, Indiana, Illinois, and New York; stone sold to paper mills, to farmers for burning into lime to be used as fertilizer, to carbonic acid plants; and also some for the making of whiting and mineral wool.

Cement production in the United States for 1907 is given as follows:

	Barrels.	Value.
Portland cement	48,785,390	$53,992,551
Natural cement	2,877,700	1,467,302
Puzzolan	557,252	443,998
Total	52,230,253	$55,903,851

The figures show an increase in 1907 of 2.4% in quantity and 1.1% in value, the smallest recorded in recent years. In the portland cement branch of the industry, Pennsylvania, with a production of 20,393,965 bbl., valued at $19,698,006, is still the leading State by a large margin. New Jersey, with an output of 4,449,896 bbl., worth $4,738,516, is second; Indiana, with a production of 3,782,941, valued at $4,757,860, is third; Michigan is fourth, with an output of 3,572,668, valued at $4,384,731; and Kansas fifth, with an output of 3,358,925, valued at $4,240,358. These five States contributed almost three-fourths of the total production, and none of the remaining States produced as much as 3,000,000 bbl. during the year.

THE SAN JUAN REGION, COLORADO.—I.

Written for the MINING AND SCIENTIFIC PRESS
By THOMAS T. READ.

In romantic interest, scenic beauty, and general attractiveness, few regions can compare with the roughly circular mountain uplift lying in the southwestern corner of the State of Colorado, and collectively designated 'the San Juan.' About 75 miles in diameter, it includes portions of the counties of Ouray, San Miguel, Dolores, San Juan, La Plata, Hinsdale, Mineral, and Gunnison, and forms a part of the continental divide. From its eastern slopes descend the tributaries of the Rio Grande, which traverses the fertile San Luis valley on its way to the Gulf, while from the gulches of the northern and western borders issue the creeks that join to form the Dolores, the San Miguel, and the Uncompahgre rivers, feeding the Colorado as it sweeps toward the Pacific Ocean.

Profound and accurate reports on the geology and mineral resources of the region have been issued by the United States Geological Survey. Many have written on its early history and development, while none have written more interestingly and entertainingly upon its general features than T. A. Rickard.[1] It may seem, then, a work of supererogation to attempt further description. But the mining industry of a region is like a living organism, affected by the opposing forces of growth and destruction, and no complete description is possible until after its life is ended. It may be worth while, therefore, to note the latest phases of development, including so much of the old as is necessary for a complete discussion. Being a popular review rather than a scientific description, no attempt will be made to credit each bit of information to its source.

Mining began in the eastern part of Colorado in 1859, when the western portion of the State was still inhabited only by Indians. In 1860 an expedition was led by Baker into the San Juan, but the outbreak of the Civil War distracted attention from the district for several succeeding years. An expedition led in after the war was opposed by the Utes, and few white men ventured to enter the region. The beginning of serious development was marked by the discovery in 1871 of the Little Giant vein, near Silverton, by Miles T. Johnson, and the discovery of the Ute and Ulay near Lake City in the same year. When these became known, prospectors flocked into the district and flourishing towns soon sprung up where only Indian encampments had previously existed. Within a few years the production became important. The feature that most hindered the development of the district was its inaccessibilty, the cost of bringing out a ton of ore being enormous. At first trails were broken, then wagon roads constructed, and finally the Denver & Rio Grande railroad crept in, skirting the uplift, and sending branches like tentacles into the interior. It reached Silverton in 1882, Ouray in 1887, Lake City in 1889, Telluride in 1890 and Creede in 1891. These branches make the mining districts comparatively accessible, but large areas are still difficult to reach except on horseback in the summer time. A second way of meeting the problem of development was by erecting mills to concentrate the ores. But the ores of the San Juan are in general peculiarly refractory. Even by the more recent methods of milling they are difficult to treat. As a rule the extraction was low except in the case of the free-milling gold ore. The third method was that of smelting in local plants. Many of these were erected in the early days. But the obstacles encountered were even greater than those in milling, and after a more or less brief existence all were closed except the Durango plant of the American Smelting & Refining Company.

The richest ores were mostly confined to the upper oxidized portions of the veins. The poorer ores found in depth required considerable metallurgical skill to be handled at a profit, and the processes necessary were not simple enough to be applied economically on a small scale. As a result many of the smaller properties were closed when the lean ores were reached. Consolidation of interests in certain cases made possible the working of the mines upon an adequate scale. The district accordingly first enjoyed a period of intense activity, followed by a period of depression, aggravated by the great fall in the price of silver in 1893. This depression is now being succeeded by a steady growth, with sufficient capital to overcome the difficulties of working the deeper ores.

The central core of the San Juan uplift consists of ancient granites, gneisses, and schists; these are exposed in the valley of the Animas river on the south, and in the Uncompahgre plateau to the north; they are supposed to be of Archean age, but it has not been proved that they are older than the thick series of quartzites that appear near Ouray and in the Needle mountains south and east of Silverton. These latter are generally regarded as being of Algonkian age, and on their upturned edges the Paleozoic sediments lie unconformably. The oldest Paleozoic rocks well represented are Devonian limestones, exposed in the Animas valley and at Ouray. It is an important terrain for ores. These in turn are overlaid by a thick series of carbonaceous limestones and calcareous sandstones. Succeeding these is a Permo-Carboniferous series, overlaid by reddish conglomerates, sandstones, and limestones of Triassic age. These are followed by Jurassic beds and then comes the Cretaceous beds from the Dakota up to the Laramie. Minor unconformities exist in the Paleozoic and Mesozoic sections, but in general they dip to the northwest, west, and southwest at moderate angles. In the eastern part of the San Juan the Paleozoic rocks are entirely absent, the Cretaceous resting directly on the granites and gneisses, and for the most part only the Tertiary volcanics are exposed.[2]

The volcanic rocks consist of lavas, flow-breccias, and tuffs, usually andesite, but exhibiting all gradations from rhyolite to basalt, aggregating an enormous thickness, of which no accurate estimate can be

[1] 'Journeys of Observation,' T. A. Rickard. MINING AND SCIENTIFIC PRESS, 1908.

[2] Whitman Cross, Telluride Folio, U. S. G. S.

made. In the eastern portion these constitute the whole section; to the west they overlie the Cretaceous, where they have not been removed by erosion; and on the extreme southwestern border they are perhaps in turn overlain by Tertiary sediments. The stratigraphy of the region is far from simple, and to obtain an adequate knowledge of it, reference should be made to those geologic folios of the U. S. Geological Survey in which a large part of the area has

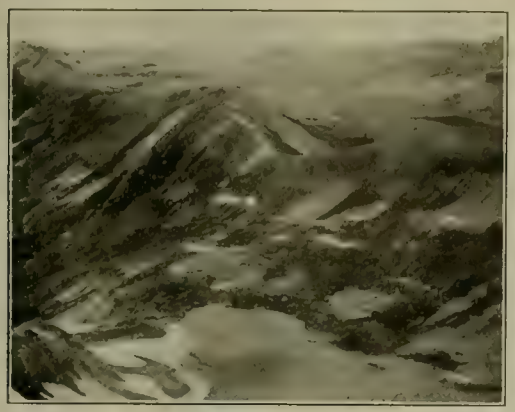


Fig. 1. A Typical San Juan Landscape.

been mapped. The position of the vents from which the volcanic materials were ejected is not known, and many other geologic problems remain unsolved.

The Tertiary disturbance gave rise to extensive fissuring, sheeting, and zonal shattering that furnished places for ore-deposition, while the magmatic and other waters, similarly stimulated in their circu-

Fig. 2. Alpine Gulch, near Lake City.

lation, brought in the metals. Almost every type of deposit except segregation from an igneous magma can be found somewhere in the area, but fissure-veins and replacements are most common and important. The ores generally contain lead, zinc, silver, and gold, with subordinate amounts of copper, but some of the largest and best known producing mines are chiefly valuable for gold. The ores are confined to no particular zone, but occur throughout the entire geological section. At Creede and Lake City, for example, the ores are entirely in the volcanic rocks. Near Ouray the ores are distributed from the Cambrian almost to the top of the Cretaceous, while a few miles south, at the Camp Bird mine, the ore-zone is again in the volcanics.

Fig. 3. A Landslide Block.

Stream erosion and the action of glaciers have

Fig. 4. Willow Gulch, near Creede.

combined with landslides and faulting to produce a region having scenic beauty only rivaled by its geological interest. The region is actually a unit, but stream-dissection has so divided it that separate names are given to different portions, as, for example, the Needle mountains. Throughout the area lofty peaks are separated by deep narrow gorges, so that

the topography is extremely varied. The larger number of peaks approximate 14,000 ft. in altitude, having shared in the earlier peneplanation, as is suggested by the closely similar elevation of all the more important mountain summits throughout the State. The mountains as a rule afford ample evidence in their denuded surfaces of glaciation, while among the commonest features are the glacial cirques, generally known as 'craters,' with the typical lake below, as shown in Fig. 1, taken from the top of Wood mountain, the lake at the foot of the cirque being 2000 ft. lower. Terminal and lateral moraines are common. A conspicuous terminal moraine can be seen on the San Miguel river a few miles below Telluride, just above where the Lake fork joins the main stream. Stream cutting has often altered the glacial topography, as shown in Fig. 2, looking up Alpine gulch toward Red Cloud peak near Lake City. In the bottom of the U-shaped glacial valley the stream has cut for itself a deep gorge. Another striking feature of the topography consists in the frequent 'landslide blocks,' one of which is shown in Fig. 3. These landslide blocks are frequently of large extent. In the southwestern portion of the San Juan a mine was developed in what subsequently proved to be a landslide fault-block, and the original position of the vein was never discovered.

Creede is the principal town and county seat of Mineral county, and is also the youngest of the mining camps of the San Juan. The camp dates from 1891, when the Denver & Rio Grande railroad was built to this point, and the rich silver ore of the Holy Moses was discovered by Bill Creede. Other discoveries followed, and the production for 1892 had a value of about $3,500,000, the total production previous to that year amounting to about $150,000. It seems strange that the camp remained so long undeveloped, for it lies near what was for many years the main line of travel and freighting between the eastern part of the State and the San Juan. The packers started from Fort Garland in the San Luis valley, followed the course of the Rio Grande river, and turned to the left below Creede through Antelope Park to Lake City, Ouray, and Silverton. Singularly, too, the original discovery, though possessing some exceedingly rich ore, was never a source of much profit.

All the mines are within a radius of two miles from the junction of the east and south branches of Willow creek, a few miles above where it flows into the Rio Grande. The character of the ores has changed markedly in the 15 years since the district was opened. The upper portions of the veins were extremely silicious, and rich in silver. With increase in depth the silver content has become less important, while galena and zinc-blende, with a variable but not inconsiderable amount of free gold, have become the valuable constituent of the ores. Consequently the region has largely changed from a shipper of crude ore to a producer of milling ore, although the total shipments are still in excess of the output of concentrate. The shipments for 1906 were 38,600 tons of crude ore and 31,600 tons of concentrate. The value was over $1,000,000 in silver, nearly a million in lead, a little less than a half million in gold, and about a hundred and fifty thousand in zinc.

Looking nearly east up Willow gulch from the town of Creede (Fig. 4), one sees in front and to the left Campbell Mtn. rising from the forks of the stream. East Willow creek, where the original discovery was made, is to the right. Farther to the right rises the slope of Mammoth Mtn., which overshadows Creede. At the extreme left is the slope of Bachelor Mtn. The rocks are a complicated series of porphyries and flow-breccias, generally andesitic; they stand nearly vertical, and are much sheeted by pressure, and so crumpled and thrown into folds as to make their true relation difficult to distinguish. The veins generally fill fissures or sheeting-zones in the volcanics. The larger part of the present production comes from the Bachelor vein, which extends from near the junction of the two branches of the creek in a direction a little east of south for over two miles. Except in width and persistence it is representative of the veins of the district. It varies from 8 to 40 ft. wide, and dips 59° west. The hanging wall is trachyte and the foot-wall is porphyry. Included within the vein-filling are masses of the country that have usually been converted by the action of the waters to a chloritic or talcose material, but when broken open often show a core of the unaltered eruptive. Kaolinized masses are not wanting. The chief mineral in the lode matter is silica, and when chrystallized it is amethystine, but when chalcedonic it is white or yellow. The veins are 'vuggy,' and cavities lined with druses of well developed crystals are extremely common. The galena may be coarsely crystallized or fine-grained and steely; the amount of zinc-blende seems to be increasing in depth. The gold appears to be chiefly associated with the zinc-blende; it is free and rather fine; in milling, it may be seen in a thin line coming off at the head of the tables. Pyrite is subordinate in amount and chalcopyrite, though not noticeable, is present, as now and then shipments of concentrate rise as high as 20% copper. Barite appears to some extent in the south end of the vein, but is absent from the northern portion. The abundant presence of manganese is shown by its black oxides and in the amethystine color of the quartz.

The Bachelor vein is opened up for 10,000 ft. by an adit known as the Nelson or Wooster tunnel. It intersects the workings of the Happy Thought mine on the 1300-ft. level. The New York, Del Monte, Last Chance, and Amethyst are all on this vein, and operate through the adit. The Commodore mine, shown in Fig. 5, is operated through its own adits by a leasing company, which is the largest individual shipper of crude ore in the camp. Creede is typically a lessee's camp, the only concern operating mine and mill on its own account being the East Willow Co., owning the Solomon mine. The largest lessee is the Creede United, which operates a number of the properties on the Bachelor vein, and the Humphreys mill in Willow gulch. Four mills are in operation, making galena and zinc concentrate. In

the Humphreys mill the average mill ore assays 8 to 9% lead, 2 to 3% zinc, and 0.10 to 0.12 oz. gold, with a subordinate amount of silver. The milling practice in outline is to crush by rolls to 4 mesh or finer. The sized product goes to four-compartment jigs. The hutch work from the first two compartments is ready for shipment as lead concentrate. The hutch work from the second two is re-ground in Bryan mills. Both the re-ground product and the fine from the rolls are classified and treated on Wilfley tables, which make lead concentrate, zinc middling, and tailing. The zinc-middling goes to a second set of tables which makes lead concentrate, zinc concentrate, and tailing. The tailing from all the Wilfleys flows to waste over canvas tables, where some silver is caught. It is found best to throw more zinc into the lead concentrate than would otherwise be necessary for the purpose of preventing gold from getting into the zinc concentrate, as the zinc smelters do not pay for the precious-metal content. Even then it is found easy to keep the zinc in the lead concentrate below 10% and the lead above 60. One mill cleans its zinc concentrate to 60%, but this leads to excessive loss and is not to be recommended.

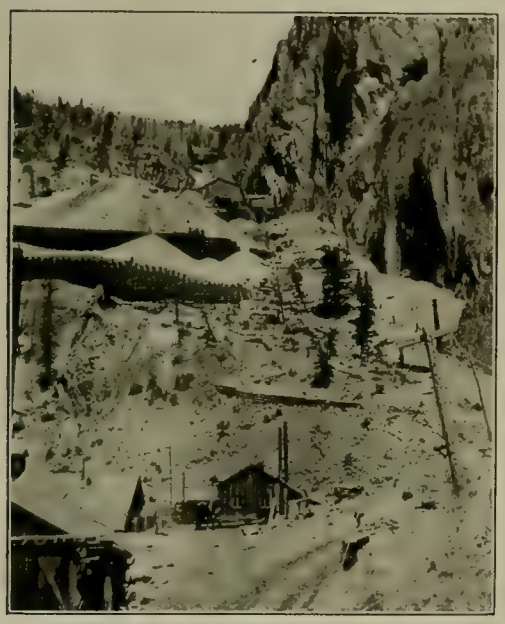


Fig. 5. Commodore Mine, Creede.

The mills are worked by water-power during the summer, but in winter it is often difficult to obtain even enough for milling. Several of the mines operate aerial tramways. One of the most interesting of these in the State is that of the Kentucky Belle, which descends in a clear span of over 1500 ft. at so steep an angle that the only convenient way to see the upper terminal is to lie on one's back.

From Creede, by the old freight trail it is but little more than 25 miles to Lake City. It may be ridden on horseback in a day, but to go round by rail consumes 2½ days. By railroad the traveler goes down the Rio Grande to Alamosa, thence north up the fertile San Luis valley, past the old Orient iron mines, once the principal producer of the Colorado Fuel & Iron Co., and over the Poncha pass to Salida, where is situated the 350-ton plant of the Ohio & Colorado Smelting Co. The trip is then made over Marshall's pass and down the canyon of the Gunnison as far as Sapinero, where a branch line extends up Lake Fork to Lake City. The canyon of Lake Fork is only surpassed by that of the Gunnison in beauty, and its physiography is replete with interest. Lake City is one of the old towns of the San Juan, having been founded in 1872. It is situated at the junction of Henson creek and the Lake Fork in a broad flat valley. Once prosperous, the town now wears an air of dejection, an effect that is heightened by the wretched hotel accommodations. Scattered about are the remains of defunct smelters, while the mills in the neighboring gulches are mostly closed down. Many important mines became lean in depth, and the ores near Lake City are more difficult to mill than those from other parts of the San Juan. The fate of local smelters in so remote a district was, of course, sealed from the first.

The chief activity at Lake City is now due to properties farther up Henson creek near Capitol City, where the Highland Boy, the Independence,

Fig. 6. Golden Fleece Mill.

and Yellow Medicine are shipping ore. The first mine at Lake City was the Ute & Ulay. Another famous producer was the Golden Fleece. The mill, now idle, is shown in Fig. 6. The ore deposits around Lake City have been described by Irving.[3] The rocks at Lake City are a confusing series of flow-breccia, tuff, and porphyries, which stand at high angles, and are frequently much sheeted and intruded by later eruptives. The veins fill fissures that dip from 45 to 60°. The ores contain sulphides of lead and zinc, with subordinate amounts of pyrite and chalcopyrite, the chief value being in the silver associated with the tetrahedrite or gray copper. It is this which makes the ore so difficult to mill, as the tetrahedrite slimes so readily. This argentiferous slime is most difficult to save. At the Golden Fleece the silver was in the mineral petzite. This was even more difficult to mill, and the extraction was so small that when the high-grade ores were exhausted the property was obliged to close.

[3] J. D. Irving, Bulletin No. 260, U. S. G. S.

MR. MURPHY ON SLIME FILTERS.

Written for the MINING AND SCIENTIFIC PRESS
By AN OCCASIONAL CONTRIBUTOR.

"'Tis a trayminjous ruckshun th' la-ads all do be havin' in th' pap'rs these days as t' which wan iv thim is th' best hand at ca-ake makin'," said Murphy one day, as he was waiting for quitting time.

"What do ye mane?" asked McCarthy.

"Why! haven't ye bin ra-adin' me frind Rick-a-ard's pap'r lately? An' ye a good an' thrue scab. I'm surprized at ye!" said Murphy*

"Ye'd think 'twas th' aftherma-ath iv a mither's congress ye were ra-adin' about. 'Ye must not mix in too much wather,' says wan. 'Ye must use Moore-Butther!' says anither. 'An sarve it with a leg-o-lamb,' says a third; an' so on. An' thin th' little Englisher with th' two fir-rst names lets out a yell, an' says, 'Ye are all iv ye doin' it th' wrong way,' he says. 'Th' right way's th' Ridgway,' he says, 'an' I'll prove it t' ye. 'Tis me onbiased perfesh-unal opinyun,' he says, 'an' what more could ye want? That th' Ridgway's th' only way, if ye are t' do it right,' he says. 'All I ask iv ye is t' ta-ake a look at me pa-atty-ca-ake masheen, which is in suc-cessful operashun at th' South Pole, an' be con-vinced,' he says. 'An' thin give me ye-er orders f'r a few iv thim,' he says.

"An' thin one iv th' ither la-ads makes a few quiet raymar-rks that ye could hear in South Afriky. 'Ye must pa-ay no attenshun, 'r money aither, 't th' rist iv thim,' he says, 'f'r if ye do ye-er no frind iv mine,' he says, 'an' I'll have th' law on ye,' he says. 'An' I mane it, f'r me lawyer has daysided in me favor all th' suits that I am about t' start agin' th' ither la-ads,' he says. 'Me system iv ca-ake makin' is th' best annyhow, an' th' cha-apest,' he says. 'I'll cha-arge ye only tin dollars a ton r'yalty, an' will let ye daysign an' build ye-er own pla-ant,' he says, 'an let ye use me frind Clancy's cha-arm t' ma-ake it wor-rk,' he says. 'An what more could ye want?'

"An' thin anither la-ad has his say. 'Niver moind what anny iv th' rist iv thim tell ye,' says he, 'f'r 'tis a lie,' he says. 'Me own system's th' best, f'r I'm a rale invinter,' he says. An' he is, McCarthy, f'r wan day he was goin' along, an' he saw a felly screwin' up a bolt with a monkey wrench, an' he had a gra-ate idea. 'I'll invint,' he says, 'a monkey wrench f'r onscrewin' bolts,' he says; an' he got a patent on it. Afther ye die, McCarthy, an' git out iv purgatory, an' git ye-er ticket all sthraightened out with Saint Pether, an' th' cha-ange counted, ye will obsarve as ye sta-art f'r th' Ga-ates, that they look annatural some way, an' as ye git closther ye will foind that they have bin turned upsoide down, an' that our frind Charley is collecktin' a r'yalty on ivery wan that enthers.

"But th' fray continues, an' th' ither la-ads all jump in an' jine it, some on wan side an' some on th' ither sides. 'Ye-er a liar,' says wan. 'Ye-er an-other,' says th' rest."

"I wouldn't let annywan iv thim call me a liar," said McCarthy.

"How could ye help it?" replied Murphy, "if there be three Sta-ates an' th' Gran' Canyon betwane ye? 'Tis safe enough that way."

"Me frind Charley gits tired iv th' fracas though, finally, so he calls up his la-ads an' tells thim t' ma-ake th' ithers shut up. 'An' if ye don't write arthicles I c'n rayfer to with pr-ride, I'll fire th' bunch iv ye,' he says. They do th' best they can, but 'tis a ha-ard job he has given them.

"An' thin, be way iv dayvarsion, th' sole an' original invinters iv th' self-actin' tube-mill linin' sta-arted a rumpus iv the'r own. It soon dayveloped into a grate riot, an' th' poleece were powerless, as they were outnumbered two t' wan, an' they had t' call out th' idaytorial nashunal ga-ard. A consul-tayshun was held, an' 'tis daysided t' char-rge th' la-ads regular advertizin ra-ates f'r all they say. 'Tis a gra-ate success, f'r not wan iv thim could raise th' price."

"What's th' use iv all th' scrappin,' annyhow?" asked McCarthy.

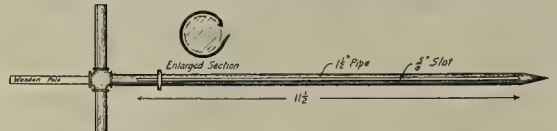
"Well, it's this way," said Murphy. "Ye see, there be a lot iv la-ads that want t' git fa-ame, but onless they have a chance t' bark when there's a fight on, it's ha-ard f'r thim to attract attenshun."

*To the Editor: This may seem unnecessary, but I was tempted to put it in, as, about the time of the Haywood trial, we found some copies of the MINING AND SCIENTIFIC PRESS in our reading-room, marked, "This is a scab paper."

A SAND-TANK SAMPLER.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. MACFARREN.

The sand tailing at the Pittsburgh-Silver Peak Gold Mining Co.'s plant at Blair, Nevada, is leached in tanks 36 ft. diam. by 11½ ft. deep, holding approximately 500 tons. The problem of sampling a charge of this depth has been met by a sampler of simple design. A piece of 1½-in. pipe, 13 ft. long, is taken, and 4 in. of one end is tapered to a closed point, while the other end is threaded for a four-way pipe connection, admitting of two short lengths of pipe being screwed into the cross to form a handle. A slot ⅝ in. wide is cut the length of the pipe, beginning just above the tapered end. This is approximately 11½ ft. long. One side of the slot



is bent slightly inward, while the other is flared out ward and filed down to a cutting edge. A collar is placed on the pipe near the handle, to indicate when the sampler has been plunged sufficiently deep into the charge. Two men are required to manipulate the sampler with ease, on account of its length, although it is possible for one man to use it. A long wooden pole is first inserted into the pipe, completely filling it, and the sampler is worked down into the sand close to the canvas. The wooden pole is then withdrawn, and the sampler is revolved, so that the cutting edge of the slot will fill the pipe with sand, and the sampler is then withdrawn. The sample is tapped out into a long receiving box.

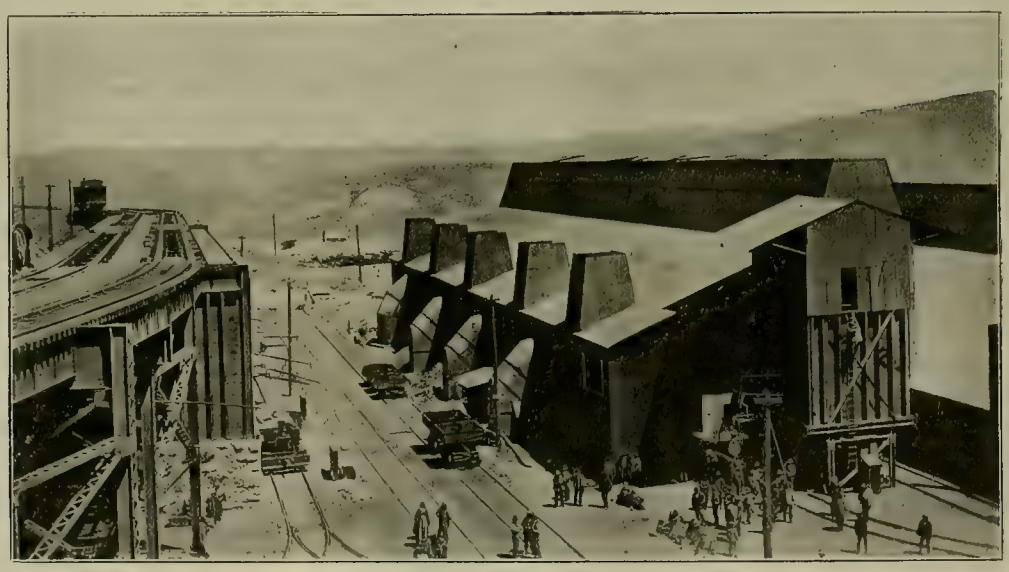
SMELTING AT CERRO DE PASCO, PERU.

Written for the Mining and Scientific Press
By Lester W. Strauss.

La Fundicion de Tinyahuarco, better known as the Cerro de Pasco smelter, is the largest plant of its kind in South America, and stands at the highest altitude, 14,000 ft. above sea-level, of any smelter in the world. The plant, together with the coal and copper mines and the railway, forms the basis of an important enterprise controlled by American capital. The management, since March, 1907, has been vested in R. H. Channing, Jr., formerly of the Utah Consolidated Co. The Cerro de Pasco Mining & Railway Co. was organized in June, 1902; it was recently reorganized and re-capitalized, to settle an expensive drainage lawsuit in Peru. The old company holds 95% of the stock of the new company.

General View of Cerro de Pasco Smelter, Peru.

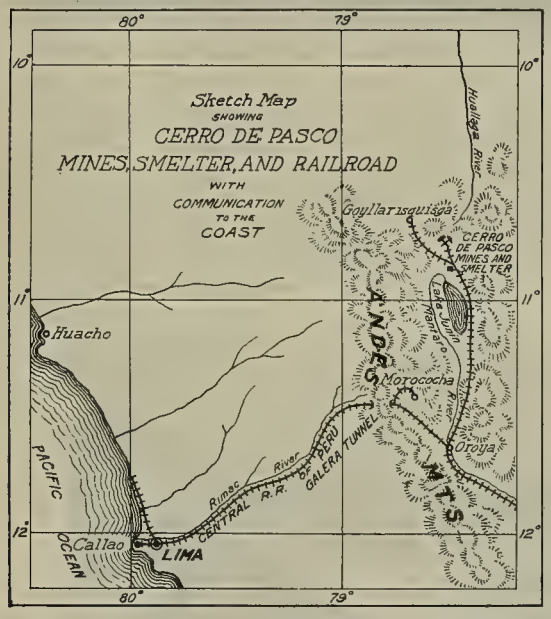
The properties are situated in the Department of Junín, Peru, and accessible from the coast (port of Callao) by the Central Railroad of Peru to Oroya, 222 kilometres (138.8 miles), and then by the Cerro de Pasco Railway, 118.5 kilometres (74 miles), to the smelter itself. To Cerro de Pasco is 13.8 kilometres (8.7 miles) farther, which place is the terminus of the main line. The trip takes 15 hr., including one and one-half hours interval for meals, going from sea-level to an altitude of 15,665 ft., at the Galera tunnel, under Mount Mieggs. The line to Oroya is single-track, and is probably one of the most remarkable railroads in the world, having a maximum grade of 4%, with about 18 switchbacks, and going through 60 tunnels. The Cerro de Pasco line, also single-track, has only one switchback, no tunnels, and a maximum grade of 2½%. The run of 82.7 miles is made in 3½ hr., including stops. The accompanying sketch map shows the relative positions of the coal and copper mines and smelter. The coal mines, located at Goyllarisquisga, are 47 kilometres (29.4 miles), on a branch line from the smelter. They furnish about 20,000 short tons of run-of-mine coal per month, delivered in 50-ton steel



Blast Furnace Building, Cerro de Pasco, Peru.

hopper-bottom cars. The railroad is also standard-gauge single-track, with maximum grade of 2½%. The coal is bituminous, rather high in ash; the mines are not 'gassy.' Coal is also mined at Vinchuscancha and Quishuarcancha.

The larger part of the ore smelted comes from the Cerro de Pasco mines, 14,300 ft. above sea-level. The ores occur on a contact between andesite and overlying limestone. They are somewhat soft and break down readily to fines. Considerable timber, shipped ready framed from Oregon, is used in the mines; the caving system is being adopted where feasible. Machine-drills are being used for stoping and development work. Four shafts have been used for hoisting the ores, but three of these are being replaced by one central shaft. The ore is screened, after delivery on the surface, through a ⅜-in. grizzly. The steam-plants for the hoists will be replaced by electric power. The present monthly ore production is 18,000 tons, delivered to 50-ton steel hopper-bottom cars. Part of the ore smelted comes from the Morococha district, 186 kilometres (116¼ miles), by rail, south-



west from the smelter. The ores smelted are principally sulphides, pyrite, chalcopyrite, galena, zinc-blende, and tetrahedrite, with some oxidized ores, such as malachite, chrysocolla, and azurite, in a silicious gangue; the Morococha gangue is aluminous. The Cerro de Pasco ores vary from 4 to 15% copper, 3 to 10 oz. silver, and 4 to 13% lead; the Morococha ore varies from 9 to 11% copper, 10 to 15 oz. silver, with no lead. These figures are estimates.

At the smelter the operations are entirely under the supervision of the general superintendent, S. J. Gormly, aided by an assistant superintendent. The various departments about the plant are headed by competent men, the whole forming a harmonious unit. On furnace work the 8-hr. system is in vogue, each shift being in charge of a general foreman, who supervises all the furnace work, its accessories and converters; shifts are changed every month. For experimental work there is an experimental chemist; in the laboratory the head chemist reports all daily determinations. The working day begins at 8 a. m. and ends at 6 p. m., with one hour for the midday meal.

About 1400 tons of ore, lime-rock, and coal are run in daily, weighed, and delivered to their respective bins; the ore to be sampled being deposited in the steel hopper-bins behind the sampling-mill; and the coal, except that for the power-house, which is dumped there, being delivered to the bins at the coal-washer. The ore-bins are flat-bottomed, steel-framed with wooden lining, having a total storage capacity of about 15,000 tons; the lime-rock bins are of similar type. The charge cars, of the same type as those used at the Washoe (Montana) plant, are loaded with 2.5 metric tons (2.75 short tons) of charge-ore and flux, and are made up in trains of six cars; they are spotted and switched about by Davenport locomotives. They have proved satisfactory, not giving much trouble from steam or smoke, and form a flexible system, which is impossible with electric motors, where burning-out, short-circuiting, and so forth, would be costly as well as dangerous. Compresesd air would be more costly than the present system.

The eight Babcock & Wilcox boilers are rated at 400 hp. each, under a pressure of 150 lb., and are hand-fired, using about 180 tons of run-of-mine coal daily; the ashes are run to the waste pile, or used as railroad ballast. Natural draft is used, the chimney being about 180 ft. high and 12 ft. diam. inside. The power-house immediately adjoins the boiler plant. There are two Nordberg cross-compound engines, 16 by 32 by 36-in.; 550 hp. each, making 120 rev. per min., driving two alternating current dynamos of 440 kw. each. These supply the electric power used. Three Root blowers, No. 11, running at 120 rev. per min., giving 350 cu. ft. per rev. at 24-oz. pressure per square inch to the blast furnace, or a total of 126,000 cu. ft. per min., are individually driven by a Nordberg tandem-compound Corliss engine, 15 by 30 by 36-in., using a 16-ft. flywheel and taking 450 hp. A Nordberg cross-compound blowing engine, 27 by 54 by 60 in., making 68 rev. per min., requiring 800 hp., supplies 12,000 cu. ft. of air per minute at 17 lb. pressure per square inch to the converters. A duplicate of this is being erected. A Nordberg duplex air-compressor, 18 by 18 by 42 in., supplies air at 70 lb. pressure to air-lifts for opening charge-doors, unloading charge-cars, and the like. A new two-stage Nordberg compressor, 14 by 27 by 16½ in., with 42-in. stroke, is being erected. For emergency lighting, there is a 14 by 14-in. Ball automatic cut-off engine, making 250 rev. per min., connected with a 3-phase, 75-kw., 2300-volt, alternating-current generator. There are two exciters; one a 11 by 11-in. marine-type engine, making 280 rev. per min., connected with a 50-kw. 125-volt direct-current machine, and the other a 10 by 24-in. Corliss engine, making 120 rev. per min., connected with a 50-kw. machine of the same type as the above. For supplying hydraulic pressure to the converters, two 14 by 7 by 15-in. outside-packed trombone-style pumps give 300 lb. pressure per square inch; two of the same type of pumps are used

for feed-water to the boilers. The boiler and machine shops are fitted up to do all repair work for the mines, smelter, and railway. The foundry is equipped with a 50-ton Whiting No. 5 cupola, a No. 6½ Root blower, and a 10-ton electric crane. Considerable custom work is done in the shops. The company is able to repair and completely equip the 50-ton consolidated 8-driver and 19 by 26-in. cylinder Mogul type locomotives. The switching engines are the Davenport type, 9 by 16-in. cylinders, carrying steam at 150 lb. pressure per square inch; a new type of engine will shortly be used; and also a 45-ton saddle-tank, with 4 drivers and 18 by 22-in. cylinders. Besides the carpenter shop, there is a pattern and tinning shop.

Reverberatory Furnace, Cerro de Pasco Smelter.

The water supply is brought from a lake about three miles distant, using an inverted siphon one mile long. To insure a sufficient supply of water a pump-station has been erected, about 1.5 miles from the plant, which will pump about 1000 gal. per min. from a small stream to a ditch leading to the smelter. At present about 2500 gal. of water are being used per minute. A master mechanic is in charge of the machinery and shops above mentioned; he is held responsible for the continuous running of the plant. Each department under him is in charge of a foreman.

The sampling-mill is equipped with three Vezin and one Bridgeman sampler, each taking $^1/_5$ cut. The accompanying flow-sheet shows the process involved to produce the final sample. Each ton of ore yields 3.2 lb. of sample, that is, 0.16%. The final sample, reduced to ⅛-in. size, is quartered, then crushed in laboratory rolls, cut down on riffles, pulverized in a Braun pulverizer, and passed through a 120-mesh screen. All samples for the laboratory are reduced in the mill, placed in paper sacks, marked, and sent to the chief chemist. The 'rejects' from sampling are elevated and screened through a ½-in. grizzly, the fines going to the reverberatory, and the coarse to the blast-furnace bins. The capacity of the mill is about 200 tons per 10 hr. Every third car from the mine is sampled. Shaking-feeders deliver the ore to each sampler.

(1) Bin.

(2) Blake crusher, 24 by 18 in. (Size of ore, 6 in.)

(3) Elevator.

(4) First cut: sample, 400 lb., to (5); reject, 1600 lb.

(5) Blake crusher, 20 by 13 in. (Size of ore, 1½ in.)

(6) Second cut: sample, 80 lb., to (7); reject, 320 lb.

(7) Rolls, 15 by 40 in. (Size of ore, ½ in.)

(8) Third cut: sample, 16 lb., to (9); reject, 64 lb.

(9) Rolls, 4 by 8 in. (Size of ore, ⅛ in.)

(10) Fourth cut: sample, 3.2 lb.; reject, 12.8 lb.

(11) Pulping and quartering for analysis.

The coal-washer makes two commercial products: steam or nut coal (¾ to 1½ in.), used for the reverberatory furnaces and for the Davenport engines; and coking-coal and 'sludge' (finer than ¾ in.), used to make coke. The plant has a capacity of 350 tons of run-of-mine coal per 9 hr., running only on day shift, recovering 70% of the coal washed, that is, a finished product of 250 tons of nut or steam-coal and coking-coal, and sludge, and 100 tons of waste. Electric motors are used to drive the machinery, about 135 hp. being consumed. The supervision of the washer and coking plant is under a capable superin-

Converter Floor and Crane, Cerro de Pasco Smelter.

tendent. The Williams disintegrator, with a capacity of 500 tons of coal per 10 hr., is replacing a toothed roll, 25-in. diam. and 30 in. face, which required considerable repairs and caused breakdowns. The jigs are of the Luhrig type, each with single compartment. The fine-jig compartment is 42 by 53 in., and the coarse 38 by 51 in.; feldspar pebbles are used for bedding. The launder system, for the several finished products, is flexible, so that the washed sizes can be diverted to bins according to demand. The clear water from the settling-tanks is pumped back for re-use, practically clear, with a 10-in. Worthington centrifugal pump. Pyrite occurs in the coal, but does not appear to much extent in the finished products. The washer tailings are run to waste, or run to railroad cars, to be used for ballast. The coking-coal and sludge is delivered to a double standard Connellsville side-dump larry, holding 9 tons, which is hauled up an incline above the coke-ovens. There is from 5 to 12% moisture in the product as charged into the ovens. The ovens are arranged in series of 35, back to back, making 70 ovens in all. They are of the bee-hive type, 12.5 ft. diam. and 8 ft. high, inside measurements. This type of oven is decidedly wasteful with the kind of coal coked. By-product ovens would afford use of the gases, would give a better coke, with less wear and tear on the plant, although requiring more capital for erection. Each oven can produce 3.45 tons of coke per 48 hr., the time required to coke a charge of 5.8 tons of coking-coal and sludge; about 60% of the charge is recovered as coke. The escaping gases are not used. The coke is granular, fairly porous, strong, and obtained in lumps as large as 20 by 12 by 5 in.; it remains intact until reaching the zone of fusion in the blast-furnace. From 100 to 120 tons of coke are produced daily. Hand labor is used entirely.

In the washer the coal products are sampled every hour, taking 'grab' samples. These samples, together with coke samples, both domestic and foreign, are analyzed every 10 days. The following analyses are representative:

	Volatile matter, per cent.	Fixed carbon, per cent.	Ash, per cent.	Sulphur, per cent.
Domestic coke ...	1.6	66.3	32—35	0.9
Foreign coke	1.4	88.2	10.5	.....
Raw Coal	37.1	32.2	30.8	1.62
Steam or nut coal	41.8	35.6	22.6	0.98
Coking coal and sludge	40.8	38.2	21.0	1.33
Refuse	24.0	14.8	61.2	3.75
Raw coal for boilers	34.8	36.1	29.1	.....
Ashes from boiler coal	4.4	17.8	77.8	.....

The ash contains about 60% SiO_2, 28% Al_2O_3, 9% FeO, and 3% CaO and MgO.

All the bricks used, both fire and silica, are made in the local plant, distant some 10 miles from the smelter. The silica-brick contains about 98% SiO_2, with small amounts of Al_2O_3, Fe_2O_3, and CaO; it has stood the water-test better than the imported brick. The fire-brick contains about 60% SiO_2, 35% Al_2O_3, with a little Fe_2O_3 and CaO. The size of brick made is 9 by 4.5 by 2.5 in., and 12 by 6 by 2.5 in.; silica bricks of the former size are being used for the side walls and the latter for the roof of the reverberatory.

The plant occupies a terraced hill-site. All the buildings are steel-framed, covered with corrugated iron. The blast-furnace building, directly in front of the ore-bins, contains the furnaces and converters. The four furnaces are arranged with their longer axes parallel to the length of the building. Three are 56 by 180 in. and one 50 by 180 in. at the tuyeres. The smaller furnace does not drive as well as the others, probably on account of its narrower width. From the centre of the tuyeres to the charging-floors is about 18 ft., but the height of the charge, to the top of the lower jacket, is only 7.5 ft., owing to the presence of fines in the ore. Each furnace has 12 jackets, with a water-space 5½ in., four to each side and two to each end, and a tap-jacket with a 2-in. water-space. There is one foot of bosh to the total height of the side jacket, and there is no end bosh. The crucible is supported by short latticed posts, resting on a concrete foundation; silica bricks are used for the bottoms. The settlers or fore-hearths, five altogether, are 16 ft. outside diameter and 5 ft. high. The matte and slag enter the settler continuously on the side adjoining the furnace, the latter flowing away at right angles on the side opposite the matte tap, to its entrance, where it is granulated and swept away by a water-jet. The slag-launder is a 12-in. channel-bar, with sheet-iron sides. Close to the dumping-ground is a de-watering arrangement, whereby part of the water flows to an air-cooling tower, to be pumped back by two centrifugal pumps. About 60% of the water is returned. With the large volume of settler, ample storage-capacity is obtained for the matte, according to the demands of the converter; the sides of the settlers are encircled by a water-pipe spraying water continuously. Only two settlers are used for the four furnaces. The matte is sampled as it enters the matte-ladle.

The tops of the furnaces are closed, the fume passing off through elbow down-takes on two furnaces, and through old-style flues with hopper-bottoms on the other two furnaces, the fume going to the dust-flue, and thence to the dust-chamber. The dust-flues, made of brick, are 10 by 12 ft. in cross-section; the dust-chamber is 20 by 28 ft. in cross-section, and 200 ft. long, connecting with a steel stack 220 ft. high and 22 ft. outside diameter. Previously it was necessary to shut down the furnaces to clean the flues; a new flue has been made by tunneling under the old one, which will be provided with pyramidal hoppers, that will be discharged by an ingeniously devised spout, the flue-dust passing to a belt-conveyor. This spout has two gates, with slots cut at an angle of 90° to each other, connected with a rod operated by a hand-lever; one turn opens the upper gate, admitting the flue-dust, while the lower gate is closed; another turn closes the upper gate and opens the lower, permitting the flue-dust to fall upon the conveyor. With this scheme the operator does not suffer from the gases and dust, while the furnaces can be run and the flues cleaned

without interruption. Forty-four of these spouts will be used. Up to the present time the amount of flue-dust made has probably been 10%. There are 14 tuyeres to a side on each furnace, no end tuyeres being uesd. The tuyeres are 4 in. diam. and are set 12 in. centre to centre. On an average four tuyeres are cut out continually on account of accretions. Punching at the tuyeres is done as occasion demands; as a rule not much trouble is experienced. The bustle pipe, 2 ft. diam., extends along the sides of the furnace, branching off from the blast-main. Each furnace has its shut-off gates. About 460 cu. ft. of air per minute are used per square foot of hearth-area at the tuyere-level.

Two charge-cars are usually dumped at a time, by an air-lift, on alternate sides of the furnace every 25 or 30 min., depending on the running of the furnace. Coke is fed first, followed by the ore and flux from two-wheeled buggies, each holding about 225 kilos, the amount varying from 9 to 11% of the charge. At present only domestic coke is being used. Foreign coke is being accumulated to the extent of several thousand tons, in case the production of the domestic coke should be interrupted. From 90 to 110 tons of the latter are used daily, while 70 tons of the former would suffice, so that the foreign stock alone will amount to more than a month's supply, aside from the domestic coke accumulated. The empty charge-cars, after leaving the furnace, are spotted under the converter slag-bins, where air-operated gates discharge the approximate amount of slag; the train is then run to track-scales and the contents weighed. Ore is next charged from bins, the gates being operated by a hand-lever movement, and cars weighed; lime-rock is charged last, and the cars weighed. The charge, when dumped, distributes the coarse to the walls and the fine to the centre of the furnace, which tends to good running. About 15 to 20% of the ore and flux charge is lime-rock, 20% converter-slag, and 60 to 65% ore. The temperature of the escaping gases at the stack varies from 180 to 350° C. A charge of two cars is dropped in less than two minutes, so that the fall in temperature due to opening the charge doors is not important. SO_2 gas is often plentiful on the charging-floor, depending from which direction the wind blows. About 75% of the sulphur is volatilized. There is usually no over-fire nor agitation of material on the surface of the charge, due, no doubt, to the low blast-pressure, which is 24 oz. per sq. in., and to the low smelting-column. In the beginning of smelting operations, in 1906, much trouble was experienced with accretions. The percentage of fine ore in the furnace was large, and high pressures, up to 52 and 56 oz. per sq. in., were used, making work around the charging-doors quite unbearable because of the shower of hot material. Barring down was extremely trying and ineffective. 'Freeze-ups' were frequent. Elimination of a considerable proportion of the fine, reduction of pressure, increased volume of air, and low smelting-column have bettered the running of the furnaces, and have lessened the accretions and 'freeze-ups.' There do not seem to be any radical changes in the operation of the furnaces because of the altitude. The working of the furnaces may be classed as being on semi-pyritic lines.

The following analyses have been furnished by the company, the figures in parentheses being personal estimates:

		—Slag—				
	Ore, per cent.	Blast furnace, per cent.	Converter, per cent.	Matte, per cent.	Flue-dust, per cent.	Lime-rock, per cent.
SiO_2	14-29	39.0	26.0	0.7	18.0	2.7
Fe	20.8-27.8	*36.5	40.0	22.8	21.0	Trace
CaO	....	10.5	1.4	...	3.0	49.1
Zn	Tr-8.4	4.0	1.5	4.9	4.0	†39.0
Pb	Tr-8.2	0.4	0.5	6.6	9.0	‡30.4
Al_2O_3	4.2-5.2	6.0	6.8	...	7.0	1.1
S	28.6-33.2	0.16	1.5	22.6	11.0	...
Cu	(4-15 av'g 7-8)	0.24	4.25	37.8	(8.0)	...
Ag	(3-15 oz.)	0.16 oz.	3.5 oz.	38.5 oz.	(12 oz.)	

*FeO. †CO_2. ‡MgO.

The specific gravity of the slag is about 3.0, and its temperature on leaving the settler, probably 1100° C. Samples are taken hourly. The average number of daily ore-charges for the four furnaces varies from 170 to 180, equivalent to 600 to 640 tons; about 2.3 tons of ore are smelted per day per square foot of hearth-area. Total hearth-area is 272.5 sq. ft. The degree of concentration is about 5 into 1. All the charges are made on the basis of kilo-weights, the ore weighing 3200 kilos per charge.

At present there are two roasting-furnaces of the McDougall type, 18 ft. diam. and 16 ft. high, with six tiers. They handle a small part of the fine ore (½ in. and less), which forms more than 60% of the tonnage mined. The roasters are electrically driven, requiring 3 hp. each, and handle about 65 tons of raw ore, or a total of 130 tons daily. They effect a desulphurization of 75%, roasting ores carring from 25 to 35% sulphur down to as low as 8%; the calcines weigh 20% less than the raw ore. In starting the roaster about three tons of coal are used for the first six hours in the firebox below the shell. In that time the ore will kindle and burn of its own accord. The ore is fed continuously by means of a plunger-feed from a hopper above the furnace to the periphery of the first hearth. The revolving rabble-arms are water-cooled. No trouble has been experienced wth accumulated crusts or lumps of ore, as proper attention is given to their prompt removal. About 5% of flue-dust is made; this passes from the furnace through four separate up-takes to the dust-chamber, where it mixes with the fume from the reverberatory. The sulphur begins to show signs of burning on the second tier or hearth, while on the third tier the blue flame and strong sparking are in evidence. On the fourth tier the ore is quiet, and has an orange heat. The maximum heat appears on the fifth tier, where the last of the sulphur is burning off. On the sixth tier the ore is cooling and is dark except for the white particles of silica. The roasting takes about four hours. The hot calcines are dropped into a hopper, and thence, in 3-ton charge-cars, to the reverberatory furnace immediately in front. No lime-rock is used in roasting.

The following analyses, except the figures in par-

enthesis, which are estimates, have been furnished by the company:

	Raw ore, per cent.	Calcine, per cent.	Flue-dust, per cent.
SiO_2	19.5	20.8	17.9
Fe	26.6	31.4	33.0
CaO	...	...	...
Zn	1.5	2.9	2.2
Pb	6.2	8.7	5.0
Al_2O_3	4.5	6.0	4.3
S	32.5	8.5	10.9
Cu	(7.0)	(8.5)	(9.0)
Ag.	(3.0 oz.)	(4.0 oz.)	(6.0oz)

Apparent discrepancies between raw ore and calcine analyses, and between calcine and slag analyses, are due to the figures, as given, representing different classes of ore. This is due to the fact that the roaster-charge is made up of a mixture of different ores, such as fines from Peña Blanca and Noruega mines, and no separate analysis is made of the roaster-feed. The following are representative analyses:

	Peña Blanca, per cent.	Noruega, per cent.	Calcine resulting, per cent.	Slag for corresponding period, per cent.
SiO_2	18.1	17.4	20.2	33.0
Fe	20.8	27.6	35.0	...
Al_2O_3	4.6	3.4	3.3	2.4
Pb	9.1	6.0	8.5	2.8
Zn	5.9	1.6	1.8	0.3
S	28.8	33.3	9.45	0.3
				FeO 48.5
				CaO 3.0
				Cu 0.39

The discrepancy in several ingredients of this slag is due to the fact that there is a considerable amount of blast-furnace flue-dust introduced into the charge in addition to the calcine smelted.

The reverberatory building adjoins the south side of the blast-furnace and converter building. Despite the forebodings that a reverberatory would not smelt successfully, although this practice in Cerro de Pasco with coarser ore and small furnaces seems to have been followed for years previous to the advent of the American company, the present furnace has been running since the latter part of April, 1908, treating about 3500 tons of calcine per month. The adoption of this system has spelled 'success' and has overcome the difficulties experienced in the earlier operations of the blast-furnaces, at the same time lowering the smelting-costs. The furnace hearth is 19 ft. wide and 60 ft. long, over all. The actual hearth-area is 995 sq. ft. Coal is used for fuel; the escaping gases passing to a flue and thence to the dust-chamber. The steel-work consists of 8 in. 18-lb. I-beams (in the newer furnaces these will be 9-in. beams) and 1¾-in. tie-rods, with standard turnbuckles, bracing and passing over the brick-work. No tie-rods pass under the hearth. The stone foundation is filled in with molten slag; above this 2 ft. of silica (95% SiO_2) is tamped in layers of 6 in. at a time. The fire-box is 7 ft. wide and 18 ft. long. The actual grate-area is 117 sq. ft.; the ratio of grate-area to the hearth is 1:8.5. The outlet flue is 4 ft. wide and 5 ft. high, connecting with a flue 5.5 ft. wide and 7 ft. high, which passes to the dust-chamber. The skimming-door, which is at the front end of the furnace, is 18 in. high and 24 in. wide. The slope of the hearth toward the matte-tap hole is ¼ in. in 1 ft. The rise of the arch is 1½ in. in 1 ft., and the height of the interior of the furnace at the centre is 6 ft. 5 in.

Transverse expansion-joints, 2 in. wide, have been placed every 10 ft. in the length of the furnace. There are four of these. The fire-bridge has three 4-in. expansion-gaps. The bridge is 18 ft. 4 in. long and 4 ft. 3 in. wide; the top is 3 ft. above the hearth, and 2 ft. 6 in. above the grate. Air from the converter-blast passes under the conker-plate. Above the bridge the roof is pierced with 16 check-holes 6 by 8 in., arranged in two rows. From bridge to arch is 3 ft. 8 in.; the arch is made of 12-in. silica brick. The bridge on the grate side, in the new furnaces, will be faced with fire-brick, owing to trouble with clinker adhering to the silica-brick two side-doors, 16 in. high and 18 in. wide, will be placed on the fire-box, so that the bridge can be cleaned of clinker. The present furnace has three stoke-holes, 14 in. diam., closed by wheel-doors, which will be replaced by five in the new furnaces. Coal is fed from four hoppers, with 14-in. openings, almost continuously, the flames being nearly white hot. To insure good results a 36-in. electrically driven fan, making 720 rev. per min., producing 2½ oz. pressure at fan, furnishes air through a 2-ft. pipe to an open box set 12 in. below the grate-bars. The fire is 'grated' from time to time, and particularly prior to dropping a charge. Cast-iron doors have been found most suitable to enclose the ash-pit, and are opened only to allow 'grating' and cleaning out of the ashes. The escaping gases at the flue have a temperature of about 1100° C. The condition of the furnace, as regards heat, is judged by watching a slit in the outlet flue from the fire-box platform. It is believed that a deeper fire than the 20 in. of coal now carried on the grate, and higher pressure (only 1½ oz. being now effective at the grates) would induce faster driving. There are four rabble-doors to a side, each 16 in. high and 18 in. wide. Only the two nearest the fire-box are used, and these are to take care of the 'floaters.' The side-walls are made up of 22½-in. fire-brick and 9-in. silica brick. Of the six charge-openings beneath the charge-hoppers, which are fed from the roasters, only two to four are used; the diameter of the charge-opening being 16 in. Calcine is fed in 9 to 15-ton charges every two to three hours, depending upon the running condition of the furnace. With a 9-ton charge about 800 lb. of CaO, about 1500 lb. of lime-rock as a maximum, is added, according to need. Should there be a scarcity of calcine, flue-dust is also charged up to three to four tons. The charge falls on a bath of 14 to 16 in. of slag and matte, and soon begins to fuse; as the doors of the furnace are closed, very little flue-dust passes to the flue. Skimming is never begun less than one hour after charging, usually after three to five charges, and at least once a shift; it takes from 20 to 30 min. for the process, depending on the amount of slag. As can be judged from the analysis, the slag is quite fluid, flowing away like water; the long

hearth, high heat, and fluid slag effect a clean separation of slag from matte. A matte-trap 4 ft. long, 2 ft. wide, and 18 in. deep, is used just below the skimming-door; from this pot the slag is being run to fill foundations for the new reverberatories, and later will be granulated and washed away by a jet of water passing below the matte-trap.

Matte is tapped according to the needs of the converter; at least four to five ladles are tapped every 24 hr. The matte is run out from the furnace in a semi-circular clay-lined launder, 12 in. wide, dropping into the ladle, which is spotted in a pit close to the furnace. It is customary to keep about 13 in. of matte in the furnace. The matte tap-hole is covered with a 12 by 14-in. cast-iron plate with 2-in. tap-hole in the centre. Fettling of the furnace is necessary about every two months, and takes from 5 to 6 hr.; 95% silica is used. It takes 48 hr. to warm up the furnace. About 35 to 40 tons of coal (nut size, from the washer) are used daily on an average of 110 tons of ore; this means 3 tons of ore to 1 ton of coal. There is 0.44 lb. coal burned per minute per square foot of grate-area. The degree of concentration is 4½ tons of ore to 1 ton of matte. About 220 lb. of ore are smelted per square foot of hearth-area per day. The following analyses have been given by the company:

	Reverberatory slag, per cent.	Reverberatory matte, per cent.
SiO_2	32.00	0.41
FeO	53.00	Fe 20.00
CaO	0.80	...
Zn	1.20	2.60
Pb	2.70	16.20
Al_2O_3	4.00	2.80
S	0.33	22.30
Cu	0.39	36.50
Ag	0.16 oz.	17.0 oz.

35% of the sulphur is volatilized.

The converters are in front of the blast-furnaces. There are 4 stands and 12 shells, of the vertical type, 7 ft. diam. and 14 ft. high over all, having a rated capacity of 10 tons of matte. They are operated by hydraulic power, under a pressure of 300 lb. per sq. in.; air-blast is used at 17 lb. per sq. in. When new, the inside dimensions are 3.5 ft. diam. and 8 ft. high. Silicious ore and clay are used for lining. The lining runs about 70% SiO_2, and carries low gold and silver content. About 1200 tons of silicious ore, and 500 tons of clay are used monthly, for 225 re-linings, about 7.5 tons entering into one lining. A lining lasts about three charges. The matte-ladle has a capacity of 6⅞ tons of matte when filled to within 6 in. of the top. It is spotted by the crane under the launder of the blast-furnace settler, and about 5 ft. below the matte tap-hole; the launder is 12 in. wide, semi-circular, and clay-lined. The matte is poured while the converter is in a horizontal position. As the shell is turned up, air is gradually admitted below the matte. The first charge is usually 2.5 tons, the 'blow' taking about 22 min.; then more matte is added, after the slag has been skimmed. About 5% Zn and 7.5% Pb are volatilized. After the first charge has been poured, floor-cleanings are added prior to the matte, and no silicious ore is charged. It takes 1 hr. 10 min. from the beginning of the first blow until blister-copper is ready to pour. As much as 1½ hr. is frequently consumed in pouring the copper; it is cast into flat cakes, about 2 by 18 by 24 in., weighing approximately 100 kilos. Sampling is done with a long-handled ladle, which catches the splashings from the pour. Previously the copper was cast in bars 8 in. thick, somewhat wider at the top than at the bottom, and 2 ft. long; drill-samplings of these bars gave unsatisfactory results. The cakes assay 99% copper, 100 oz. silver, and 0.10 oz. gold. About three charges are made per stand per each 8 hr. The converter slag is poured from the ladles into a casting machine, from which the molded slag is water-cooled, sledged, fed to a crusher, and then elevated to the bins above the feed-floor of the blast-furnaces. The slag forms a desirable mechanical and chemical flux for the blast-furnaces. Two 5-ft. clay-mills, electrically driven, grind and mix the converter-lining. The clay is mined in the hill back of the power-house. A compressed-air rammer, taking the same air as the converters, is used for re-lining. Two 40-ton steel cranes handle the matte ladles, converter shells, and the like. They have a 60-ft. span. There are four motors, requiring about 75 hp. Alternating current has not proved very satisfactory, causing delays and expense in burn-outs, due to the variable load. The converter-hoods communicate with a steel-flue which passes to the large dust-chamber, together with the blast-furnace dust. Probably 1½ to 2% of flue-dust is made. The hood accretions run high in lead. They are usually re-fed to the converter. The converter-flue is cleaned once a month, and the dust is fed to the reverberatory. At 8 a. m. daily the blowing engine is shut down and is thoroughly inspected, taking one half to three quarters of an hour.

The additional plant planned and now under construction will consist of eight McDougall roasters, four reverberatories, and a copper-casting machine. A separate dust-chamber and stack-mouth, 450 ft. above the reverberatory floor, with an inside diameter of 21 ft., will be built for the roasters and reverberatories. This new plant indicates the success of the reverberatories, and will mean that more ore will be handled in the blast-furnaces by diverting all the fine ore to the McDougalls. The total daily tonnage of ore smelted will be 1200 to 1300 tons.

Smelting operations began in July, 1906. From that time until March, 1907, the furnaces ran intermittently, considerable time being lost in freeze-ups. During those eight months 4,800,000 lb. of copper was produced. From March until January, 1908, with a re-arranged system of smelting, the production was 19,000,000 lb. From January 1 until August 1 of the present year, a period of seven months, about 17,000,000 lb. has been produced, July being the best month on record, with 2,700,000 lb. The probable production for 1908, at the present rate, will be more than 30,000,000 lb., and this should be increased next year to between 50,000,000 and 60,000,000 lb. In June, 1908, about 18,000 tons of ore was smelted in the blast-furnaces, requiring 4000 tons of limestone, 6000 tons of converter slag, and

2700 tons of domestic coke. The reverberatory furnace treated 3500 tons of calcine, 400 tons of fluedust, requiring 160 tons of limestone and 1100 tons of coal. The production was 2,400,000 lb. copper. In the beginning of the present month (August) a daily production of 120,000 lb. has been made, and the output for the month will be close to 3,000,000 pounds.

At present there are 900 men employed in the operating and 400 in the construction departments. Of the total 1300 men, 175 are foreigners, chiefly Americans. The native laborers, 'cholo,' or half-caste Indians, are not efficient, lacking ordinary intelligence and interest in the work. They serve, however, owing to cheapness and necessity, receiving an average of 75c. per day. Active work in high altitudes is trying, physically and mentally. Every six months the higher class of foreign labor is allowed 10 days respite in lower and warmer regions. The weather at times is very disagreeable, much snow, hail, and rain, but clear days are exhilarating; the nights are cool. The company has built a comfortable club-house for the use of the American contingent. It contains a library and reading-room, bowling-alleys, billiard and pool-room, gymnasium, plunge-bath, and so forth. The boarding-houses, to accommodate the Americans, are run by the company at a monthly deficit. A nominal sum of £5 per month is charged for room and board. The Cerro de Pasco Mercantile Co. operates a large store in conjunction with three others at the coal mines; there is none in Cerro de Pasco. A small hospital, with four or five beds, is situated close to the plant; a larger main hospital, with 50 beds and all modern equipment, is being built at Cerro de Pasco.

The company refuses to give cost data, but the following figures may be considered reliable estimates of operating costs:

	U. S. Cy.
Coal mined and delivered in cars at the mine, per ton	$1.75
Coke, including mining, freight, washing coal, and coking, per ton	6.00
Ore mined and delivered in cars (including timbering costs) at Cerro de Pasco, per ton	3.00
Smelting costs, blast-furnaces, roasters, reverberatory, converting, etc., per lb	0.05
Cost of copper laid down in New York is, after deducting gold and silver, per lb	0.08

The replacing of foreign coke entirely by domestic has effected a reduction of more than 2c. per lb. of copper. It may be of interest to add some general figures as regards costs:

In construction of the smelter:	
Steel laid down at Callao, per lb	$0.0225
Steel laid down at smelter, per lb	0.0325
Erection of steel, per lb	0.04
(Contractor lost money.)	
Engines and electrical machinery at New York, per lb	0.04
Ditto, at smelter, per lb	0.065
Timber at Callao, per 1000 board feet	43.00
Timber at smelter, per 1000 board feet	70.00
Coke in Callao, per 2240 lb	16.00
Coke at smelter, per 2000 lb	36.00
Freight from New York to Callao, via Panama:	
Material lighter than 2 tons, per cu. ft	0.40
Material heavier than 2 tons, per 100 lb	0.60

With the new plant in operation and a new 10,000-hp. electric plant, run by water-power under 600-ft. head, costing $850,000, which will supply mines and smelter and lower costs of copper 1¼c. per lb., the probable cost per pound of copper laid down in New York, after deducting gold and silver content, might be 5c. This figure compares favorably with the operating costs of larger plants in the United States, where commodities and freights are less expensive. It might be noted here that the smelter warehouse carries a stock valued at $500,000, which large supply is necessary owing to the unreliability of prompt delivery of freight by steamers and railroad. Freight might take from 25 days to 6 months to arrive in Callao. Under the present management the policy of lowering costs and increasing production will be pursued to the utmost limit.

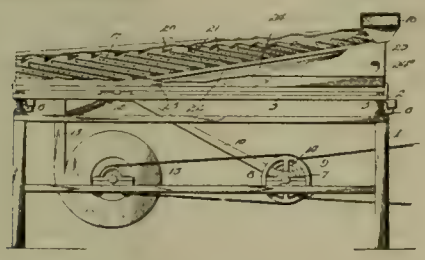
Tungsten production in the United States for 1907 amounted to 1640 short tons, the value being $890,-048. The principal tungsten minerals are wolframite, a tungstate of iron and manganese, and scheelite, a tungstate of calcium. Both minerals, like tin ores, occur as a rule in quartz veins cutting rocks containing much silica, such as granite and rhyolite, but some apparent exceptions are found, as for instance, in New Mexico, where hübnerite and a small amount of scheelite occur with pyrite and lead minerals in a vein cutting limestone; and at Nome, Alaska, where scheelite is found in the gold placers in a region of schists several miles from the nearest granite outcrops. The greater part of the American tungsten product came from the mines in Boulder county, Colorado, which reported an output of 1146 tons of wolframite valued at $573,642.74. In California, which was the second State in order of production, the output was in the form of scheelite, as was also most of that from Montana. The total scheelite reported was 414 short tons. Small amounts of tungsten ores were produced in Washington, Nevada, Arizona, and New Mexico. In other countries besides the United States the production of tungsten was notably increased during 1907. The output of Australia (including Tasmania), amounting to 1643 tons, was, however, the only one that exceeded that of this country. Reports of production from South Africa, New South Wales, and the northern territory of Australia show marked increases. Spain, New Zealand, Austria, and Germany, with a combined production during 1906 of 463 short tons, have not made public their figures of production for 1907, but it seems probable that there will be increase. Tungsten deposits, according to F. L. Hess, of the U. S. Geological Survey, are usually pockety, the ores occurring in lenticular masses or shoots in veins. Those occurring at the surface are often quickly and easily mined, and it may then require all the profits made from the first-exposed orebody to find another one. However, the veins carrying tungsten minerals are generally of deep-seated origin.

In Queensland the deposits exposed on the surface have been largely exploited, and the production has, in the face of rising prices, fallen greatly since 1905.

MINING AND METALLURGICAL PATENTS.

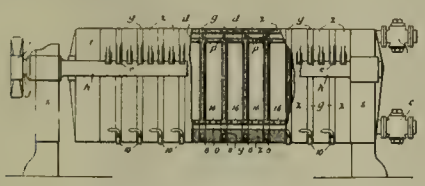
Specially reported for the MINING AND SCIENTIFIC PRESS.

ORE-CONCENTRATOR.—No. 900,442. Albert H. Stebbins, Los Angeles, California.



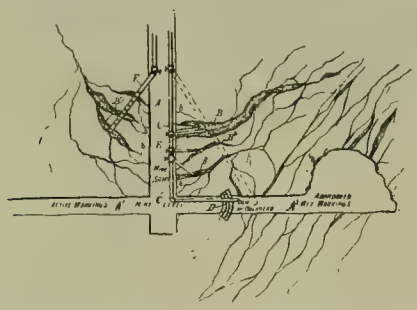
In an ore concentrator, the combination with an inclined and diagonally disposed perforated plate, a stepped or zigzag wall at the upper side of said plate, and riffles extending across said plate from the wall opposite said stepped or zigzag wall so arranged as to direct the material against said zigzag wall.

PRESSURE-FILTER.—No. 900,184. Charles W. Merrill, Lead, South Dakota.



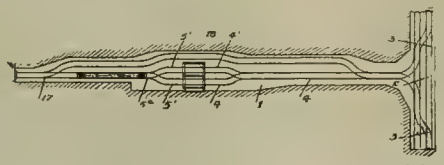
In a pressure filter, the combination with a container, of a grille or grating placed on either side thereof entirely within the same and in such position that when the container is put together with the filter plates in a filter press, said grille will retain a layer of unfilterable matter or precipitate.

PROCESS FOR STOPPING OR SEALING OFF UNDERGROUND FLOWS OF WATER INTO MINE-WORKINGS, ETC.—No. 900,683. Edmund B. Kirby, Flat River, Missouri.



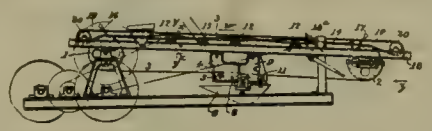
The described process of sealing off flows of water issuing from the earth's crust into excavations made therein, which consists in the introduction into said flows, at any convenient points prior to their points of exit, of any kind of solid matter which is capable of being carried by said moving flows toward said exits and of accumulating and choking up the passages leading thereto.

SYSTEM OF MINE-TRACKAGE.—No. 900,903. Freeman R. Wilson, Jr., Worthington, Ohio.



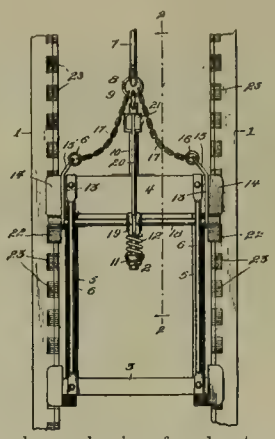
A track system for a mine cage room, comprising the loaded car track 4 extending from the room doorway to the mine shaft, and a return track extending from the opposite side of the mine shaft to the said doorway, said return track having a down-grade section 5, an up-grade section 7, and thence a down-grade section to the room doorway, and a car haul mechanism for said up-grade section 7, substantially as set forth.

PROCESS FOR SEPARATING METALS FROM THEIR ORES.—No. 899,478. Jacob D. Wolf, London, England.



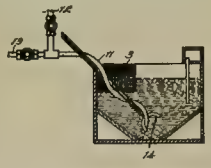
The herein described method of separating metals from their ores which consists in forming a pulp; passing said pulp containing the metals over an oily adhesive substance; and in abrading the surface of said substance by drawing apart the body of the same, and thereby causing some of the mineral particles to adhere thereto, substantially as described.

SAFETY-BRAKE FOR ELEVATORS AND MINE-CAGES.—No. 901,314. Auguste Barbieux, Mecca, Indiana.



In a safety brake mechanism for elevators, the combination of guides provided upon the opposite sides thereof with clutch teeth, a car having a head beam, bearing plates vertically mounted upon the ends of the head beam and provided with outwardly extending vertical flanges forming guides, depending bearing portions projecting below the head beam and ears projecting above the head beam, a vertically sliding bar mounted upon the head beam and adapted to be connected with the hoisting cable, spring means for resisting the upward movement of said bar and drawing the same downward when the cable breaks, stay connections between the upper end of the bar and the ears of the bearing plates, rock shafts extending across the car in parallel relation below and on opposite sides of the head beam and journaled in the depending bearings of the bearing plates, dogs upon the outer ends of said shafts to engage the clutch teeth of the guides, a cross head upon the upper end of the bar, crank arms upon the intermedite portions of the shafts, and links connecting said crank arms with the cross head.

RECOVERING SILVER FROM SOLUTION.—No. 901,124. Thomas A. Ross, Selby, California.



Means for agitating value bearing solutions, said means comprising a stirrer-member and a flexible pipe having its lower end carried by the stirrer-member and freely movable thereby and adapted to inject a compressed fluid into the body of the solution.

COMPANY REPORTS.

GRANBY.

The Granby Mining, Smelting & Power Co., operating in the Boundary district, British Columbia, has just issued a report for the year ended June 30, 1908, which compares as follows:

	1908.	1907.
Copper, lb.	21,126,926	16,410,576
Silver, oz.	300,593	257,378
Gold, oz.	40,139	35,083
Gross earnings	$3,790,184	$4,521,548
Charges, etc.	3,435,760	1,673,529
Net profit	354,424	1,848,019
Dividends	675,000	1,620,000
Deficit	$ 320,576	$ 228,019
Previous surplus	2,775,757	2,547,738
Profit and loss surplus	$2,455,181	$2,775,575

The general balance sheet as of June 30, 1908, compares as follows:

Assets.	1908.	1907.
Cost of land, real estate, machinery, buildings, dwellings, and equipment	$15,238,437	$15,180,914
Stocks, bonds, and bills receivable	1,008,013	895,675
Fuel and store supplies	185,324	130,537
Cash and copper	421,625	853,280
Totals	$16,853,399	$17,060,406
Liabilities.		
Capital stock issued	$13,500,000	$13,500,000
Dividends collected on liquidated shares	1,324	884
Accounts and bills payable	896,895	783,765
Surplus	2,455,181	1,775,757
Totals	$16,853,399	$17,060,406

The price realized on fine copper averaged 13 1/3 cents per pound, and gold $20 per ounce. The net cost of copper, after deducting gold and silver, was 10.31c. per lb. The cost of a ton of ore, including all expenses, was $3.486.

The president, J. Langeloth, says:

"The mechanical devices now in operation, such as hoists, shafts, belt-conveyors, mine-cars, and electric locomotives, are able to handle about 5000 tons of ore daily. The mines shipped to the smelter a total of 858,432 tons during the last year, against 644,549 tons during the previous year. The grade of ore mined was not as good as in the previous year, carrying about one pound less of copper and 10 to 12 cents less per ton of ore in gold and silver. The extraction per ton of ore on the average was 23.42 lb. copper, 0.2865 oz. silver, and 0.0454 oz. gold, as compared with 24.43 lb. copper, 0.3088 oz. silver, and 0.0503 oz. gold in 1906-07.

"During the summer months a lower grade ore was shipped, due to mining the 'glory holes' on the surface, which are low-grade and which can not be mined during the winter months. Consequently the ores will average richer in winter and spring and poorer in summer and fall. The quantity of ore developed by diamond-drilling has been larger than the ore extracted. The total tonnage of Granby and foreign ore amounted to 882,611 dry tons, against 665,915 tons in the previous year, and there were produced 21,126,926 lb. of copper, against 16,403,497 lb. The cost per pound of copper produced, after deducting the value of gold and silver, was 10.24c., against 10.14c. and 8.35c. in the two previous years.

"Almost immediately after issuing our last annual report a most severe panic broke out, and among other disastrous consequences, the consumption of all metals decreased materially, and prices showed a heavy decline. Prices fell off from about 25 cents to close to 12 cents, and showed little recovery during the first six months of the present year, due to the great falling off in the consumptive demand for home trade, which, however, has lately shown improvement, and if this continues, as appears to be the case, it may be confidently hoped that prices will show a further improvement. The enormous decline in the price of copper and the marked influence on the cost by reason of the difficulties with which the smelter had to contend, permitted the declaring of only two dividends, namely, one of 3% on September 30, 1907, and one of 2% on June 30, 1908."

HOMESTAKE.

The annual report of the Homestake Mining Co., just issued, is for the 12 months ending June 1, 1908. In his letter of transmittal, T. J. Grier, the superintendent, states that the Homestake "has long since fully recovered" from the fire that crippled production in 1907. The orebody has been cut at 1550 ft. in a westerly cross-cut from the Elison shaft. At 1700 ft. also the west side of the same shaft has penetrated ore. Evidently the Homestake has not yet been bottomed.

No mention is made of the damage done by the fire, or of the cost to the company, except items showing that $100,000 was borrowed and $250,000 repaid. The yield of gold amounted to $4,717,746, extracted from 1,450,900 tons. This gives an average of $3.251 per ton, as against $3.592 in 1907 and $3.54 in 1906. A dividend of $546,000 is recorded among the disbursements, and a balance of $443,918. Owing to the fire, no comparison with the preceding year can be made. The cost charged against the two sand-plants for the years ending in June, 1906 and 1908, respectively, was $276,000 in one case and $194,000 in the other. This indicates a large saving. The total cost of the slime plant, as indicated by the last three annual reports, is $743,049. This includes a series of settling-vats, as well as expensive pipelines, although the Mineral Point and Monroe mills have been operated by electricity this year, and in 1906 they were charged with $38,000 for fuel, the total charged for fuel at the mills and hoists is practically the same each year, namely, $292,000. In 1908 only 10,000 tons more were milled than in 1906. The tonnage for the last half of the fiscal year ending June 1, 1906, decreased by 176,000, for this period included two months and six days after the fire had broken out. This reduced the yield per ton for the year by 22.6 cents. The lower returns for the year just ended are explained by the milling of unusually low-grade ore during the first two or three months following resumption of mining underground.

The statement of accounts is, like its predecessors, not conventional nor complete. In the foundry account we see such items as: Oil, $3.60, and sundries, $25,046.68. Among mining costs, candles have increased from $22,262 to $36,759. Labor in the mine, however, has decreased from $1,655,789 in 1906 to $1,507,144 in 1908, and $184,000 to $146,000.

CONSOLIDATED MERCUR.

The report for the fiscal year ending June 30, of the Consolidated Mercur Gold Mines Co. indicates that operations were conducted at a loss of $43,358 during the first four months of the period under review, and that this loss was wiped out in the last eight months, leaving a net profit of $2436 for the year. Extraordinary expenses were incurred in resuscitating the Brickyard and Golden Gate mines, and heavy expenditures were made for other permanent improvements. By reason of this work, especially in the mines mentioned, the ore reserves have been increased and prospects are much improved. The new slime plant has proved disappointing on the baser ores, although it has done excellent work on the oxidized material. The gross output of gold during the year was $644,354, from 226,229 tons, of which 61% was oxidized and 39% base ore. Operating expenses were $659,025. The average assay-value of the ore treated was $3.77; the tailing averaging 92 cents per ton. The cost of mining was $1.65; of milling, $1.26; the total being $2.91. The consumption of cyanide was 0.86 lb. per ton and of lime, 6.85 lb. per ton of ore milled. The general manager is G. H. Dern.

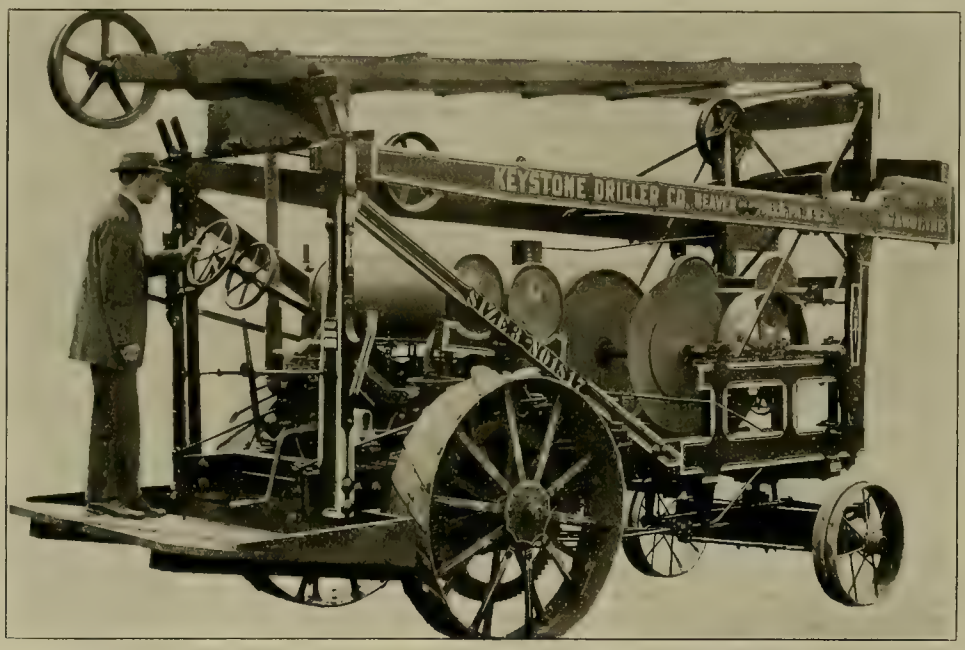
A Gasoline-Driven Drill.

While steam is the well recognized power for drilling purposes, there are many localities where fuel and water are so scarce and expensive as to prohibit its use. In many such places the slow and uncertain stop-motion horse-power drill has been resorted to; or, if gasoline engines are attempted they are applied to some sort of treadle-motion machine which allows the drill to take a time-killing rest between strokes. As distinct from all these different makeshifts, the machine illustrated herewith, while intended for localities where fuel or water is scarce, will be found a close competitor of the steam engine. The aim has been to produce a machine as nearly as possible in every respect equal to a steam-driller. In fact, the manufacturer simply takes his well known No. 3 and 5 Keystone Steam Drillers (both traction and non-traction), leaves off the steam-engine, boiler, etc., and, without other change, equips them with gasoline motors and a peculiar and specially devised power transmission.

The engines used on the drilling machines, namely 14-hp. on the No. 3 non-traction, 20-hp. on No. 3 traction, are of water jacketed to prevent overheating, eliminating danger of premature ignition, and burning out of valves. The pistons are of iron thoroughly ribbed and braced to prevent unequal expansion and contraction, and fitting close to the cylinders. Rings are made of special hard iron, about twice the thickness of similar rings in other makes of engines. Valves are made of special steel resistent to the oxidizing effect of the gases. A set of these valves should give years of service without renewal.

The area of valve openings and ports is at least one seventh the area of the piston. The cams lift the valves more than one fourth the valve diameter. With such large areas and openings the engine will operate at piston speeds of 1000 ft. per minute and take in full charges, giving the highest mean effective pressures. Inasmuch as the nominal rated horse-power of the engine is based upon piston speed of 550 ft. per minute, it is evident that the engine is capable of developing much more than the nominal rated horse-power at these higher piston-speeds.

For ignition a non-vibrator high-tension coil is used. The timer is very simple, and cannot be easily disarranged. The working and contact parts are larger than in the ordinary



the two-cylinder type with the pistons so opposed to each other in the crank that the crank-shaft receives an impulse every half-revolution. In this way one piston counter-balances the other, so that there is practically no vibration to the engine. The crank-shaft bearing and pistons are completely enclosed against dust. The entire internal parts of the engine are conveniently removable through a covered aperture in the engine-frame. This construction permits the greatest possible lightness and strength and allows lubrication to be done by the splash system from a quantity of oil in the crank-shaft pit, thus avoiding necessity for grease-cups or oilers for pistons or crank-shaft bearings. The tendency of the lubricating oil to leak outward through the main bearings of the engine is obviated by a simple check valve. The cylinders and truss of the engine are cast in separate pieces so that in case of possible injury to any one of them it can be replaced at small expense.

The engines are governed perfectly by a reliable fly-ball type of throttling governor, driven direct by the engine without belts or perishable devices, and will maintain a uniform speed at all times. The constant speeds of the engine can be changed instantly at the will of the operator and will remain exactly where left. It is impossible for the engine to get away from the control of the governor. Cylinders and frame are of cast iron, which has been found best suited for this purpose. The cylinders are thoroughly

article. All wearing parts of the timer are made in duplicates, and are inexpensive. Should the electric contacts become worn, provision is made for taking up this wear from the outside of the device in a few moments without disturbing any other adjustments.

There has been selected the most efficient dry cell on the market, and each machine is equipped with two sets of five cells each, arranged in a convenient weather-proof box. Anyone of ordinary intelligence can remove the worn cells and replace new, should it ever be necessary. Inasmuch as these cells are used only in starting and operating the motor at low speeds, the double set of cells should seldom require renewing. Batteries will eventually run down, no matter how efficient the timers and coils may be. In view of this, there is provided a mechanical source of electricity which will fill all requirements. The permanent field magneto has been found unsatisfactory for this purpose, but the electro-magnetic field dynamo will take the place of batteries perfectly, and the machines are equipped with this apparatus. It is understood that the batteries are used only in starting the engine. As soon as the engine has attained about half its normal speed the switch is thrown from the battery-current to the dynamo and it furnishes ignition-current at all times while the engine is running, thus relieving the batteries.

With all forms of electrical ignition it is necessary to

have so-called spark-coils for intensifying the electric current to produce a sufficient spark at the electrodes or sparking points to ignite the gases. Practically every other gasoline motor uses a coil having a vibrator or interruptor in the primary circuit. This vibrator requires quite frequent adjustment. We have been successful in our experiments with spark-coils, dispensing with this vibrator, and equip all machines with a special coil hermetically sealed in a box, so that it is impossible for it to become damaged or disarranged.

Each motor is provided with two sets of ignition plugs. It requires but an instant to change from the set in use to the reserve plugs. The sparking points of these plugs are made of a metal that is unaffected by heat.

The machine is equipped with two 40-gal. galvanized-iron tanks placed almost directly over the motor, in such a position as to give the proper gravity feed of the gasoline to the carbureter and cooling water to the jackets of the engine. Forty gallons of gasoline is sufficient to run the engine under ordinary loads for a period of 30 hr. About five or six gallons of gasoline is required to run the engine 10 hr. without load. Then, for every horse-power of load, one additional gallon of gasoline per 10 hr. will be required. This rule is subject to slight variation, for the efficiency of the engine increases with the load. For instance, the engine will probably deliver 20 hp. for 10 hr. on 20 gal. of gasoline, or 2 gal. per hr. The usual load will be about 7 or 8 hp., and the average consumption of gasoline from 13 to 14 gal. per 10 hr.. The evaporation of water is not at a greater rate than 2 gal. per hr., and one tank should be sufficient to cool the engine for 20 hr.; however, the water-tank should be kept over half full at all times. Any kind of water may be used for this.

This machine is provided with a regular automobile-type front axle and steering device. This axle is much stiffer than the old-style axle. The steering mechanism is of the regular worm and sector self-locking type, and is controlled by a steering wheel at the rear of the machine, and is operated nearly as easily as that of a large automobile. One and a quarter revolutions of the steering hand-wheel is sufficient to throw the steering wheels from straight ahead to the extreme right or left. This machine will turn in a much smaller circle than the old style.

Makers of well-drilling machinery have been trying for twenty years to adapt gasoline engines to the operation of this class of machinery. All attempts have hitherto been unsuccessful, because of the lack of a practical and dependable graduated reversible power-transmission. We have perfected a device for this purpose. It consists of a combination friction driving disk and fly wheel on a motor and a driven wheel on a transverse transmission shaft. On this shaft, at one end is placed the pulley which drives the drilling mechanism with a belt, and on the other end of the shaft is placed the traction driving gear. This transverse shaft rotates in large slidable, hardened-steel ball bearings, arranged to engage or disengage the driven-wheel with the friction driving-disk. It is understood that the driven-wheel is arranged to slide entirely across the face of the driving-disk, and in that way the speed graduation from '0' to 'high speed' or 'reverse' is obtained, that is, in sliding this driving wheel from the centre toward the periphery, to the right, gives all speeds from '0' to 'high speed' ahead, and from the centre to the periphery, to the left, gives the graduated increasing speed backward.

The friction driving-disk has a hard-wood filling, which is put in on the end-grain, and is arranged to wear down 2 in. before needing renewal. It is our belief that this filling will last as long as the machine; but if it should wear down it can be replaced by anyone, in the field, by nailing a new layer over the friction-surface and turning it down to the proper shape.

In operation the motor runs constantly in one direction at a pre-determined and governed speed (which may be at will anywhere between 250 and 500 rev. per min.), and at such speed it will produce any power placed upon it, from no load to full load, as required.

Commercial Paragraphs.

The Hampson-Fielding Engineering Co., Denver, has received the contract for a 12,000 cu. ft. blower for the U. S. Mint, at Denver.

The J. M. Dodge Company is the new corporate name of The Dodge Coal Storage Co., a subsidiary company of the Link-Belt Company.

The John A. Roebling Sons Co. has lately moved its San Francisco office to its new five-story building at Folsom and Hawthorne streets.

Wellman-Seaver-Morgan Co. announces that its San Francisco office has been moved to the Marvin Bdg., 24 California street. W. Q. Wright is manager.

The A. S. Cameron Steam Pump Works, New York City, has added a condenser department to its already immense organization, and announces that it is prepared to build jet, surface, and barometric condensers. The Company has a well deserved reputation for reliability and character in its pump business, which should recommend it to prospective users of condensers.

The Risdon Iron & Locomotive Works, of San Francisco, has obtained a favorable decision in a suit brought against the Western Engineering & Construction Co., and the Central Gold Dredging Co., of Oroville. The suit was for infringement of patent on the use of the revolving screen with spray pipe, constituting the washing apparatus on modern dredges. Judge Van Fleet of the United States Circuit Court gave this decision on October 27.

The Colorado Machinery & Supply Co., Denver, expects to occupy its new quarters at 1650-52 Wazel street, about November 10. The building is to be 50 by 110 ft., two stories and basement, and will contain the office and sales room. The machine shop and warehouses are at Walnut and Seventh streets. The Company carries a large stock of new and second-hand machinery and have secured a number of important Eastern agencies for boilers, pumps, and other accessories.

The Edge Computer is an ingenious mechanical device recently put on the market for computing the weights of plates and structural shapes, of any length, without multiplication or reference to books or tables, and with an astonishing degree of accuracy. The weight is obtained by one setting of a revolving disc, and the operation is so simple that no experience is required. The appliance is manufactured by the Edge Computer Sales Agency, New York, and will be supplied by the Mining and Scientific Press.

Publications Received.

The Cement Resources of the Black Hills. Bulletin No. 8 of the South Dakota School of Mines, Rapid City, South Dakota.

'Who's Who in Mining and Metallurgy.' Compiled by George Safford. 8vo., 195 pp. London. *The Mining Journal.* 1908. Price $5.

This is a handsome volume, giving brief biographies of leading technical men making London their headquarters.

Modern Practice in Mining: Coal, Its Occurrence, Value, and Methods of Boring. Vol. I. By R. A. S. Redmayne. 8vo., 199 pp., Ill., Index. London. Longmans, Green & Co. 1908. Price $2. For sale by the Mining and Scientific Press.

In matters of classification and geology this book is essentially British; the chapter on determining the value of fuels is excellent, as far as it goes, but it stops short of that completeness demanded of the coal-mine valuer in America; but the review of methods of boring is well worth the price of the volume. While more elaborate descriptions of boring operations exist, we are unaware of any collection of data so full as this concerning the many recent systems and wrinkles in drilling which have been brought out on both sides of the Atlantic. The chapter on surveying boreholes is also clear and comprehensive.

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EDITORIAL.

FROM SALT LAKE we have received an important letter describing a recent invention for condensing smelter fume. This letter appears under 'Special Correspondence'; it is written by Mr. Courtenay De Kalb, who is visiting the Bingham mines in our interest.

WESTERN MEN are accustomed to associate scientific sampling with the name of Brunton; therefore it is with particular pleasure that we publish a letter on this subject from Mr. D. W. Brunton. Among the improvements in metallurgical practice during the last twenty years, the invention of accurate machines for sampling is one of the most noteworthy, for no work in mine, mill, or smelter can be checked intelligently without exact knowledge of the contents of the ore.

FIFTEEN CENTS for copper before the end of this year is confidently predicted among the metal brokers. Most of the large producers have disposed of their output up to January, and even into February. The Pennsylvania Railroad Company has signed a contract with the Westinghouse Electric & Manufacturing Company for $5,000,000 of material to be used in electrification of its railway system. It is estimated that $30,000,000 will be expended in similar work on the Pennsylvania and its branch lines. This indicates an outlet for copper.

DURING the 12 months ended June 30 the yield of gold from the mines of the Transvaal was £28,514,311, as compared with £26,640,490 in the previous year. The total profits for the eight months ended on August 30 was £7,852,454, and the dividends £4,262,672, as against £3,365,584 for the corresponding period of 1907. This improvement is credited to the increased use of tube-mills, greater efficiency of native labor, and better results from the deep-level mines.

IT IS DANGEROUS to christen a mining camp for mineralogical reasons until scientific evidence is available. Telluride, in Colorado, is a poor place to get specimens of telluride ore, and at Cuprite, in Nevada, you can get stains of copper carbonate more readily than the sub-oxide; as also at Malachite, in Huerfano county, Colorado. There are 13 post-offices in the United States named Galena, from which the wide distribution of lead ore may be inferred. Cobalt proved no misnomer, although it was silver that made the cobalt ore commercially valuable. Alunite is aptly named; only everybody does not know what alunite is. Tin City and Cuprum are names recalling "the saddest words of tongue or pen," for they refer to the confident hopes of a mineral development that

"might have been". These remarks are prompted by the receipt of specimens of telluride ore from the new mining district of Sylvanite, in New Mexico. The characteristic ore proves to be tetradymite, the telluride of bismuth, which in this locality fortunately is associated with gold. If the name had been Teaubi, combining the chemical symbols of tellurium, gold, and bismuth, the new camp might have reminded the traveler of a Maori watering place.

WE NOTE with interest that Mr. Hammond's name is mentioned as a possible Secretary of Commerce and Labor in the cabinet to be formed by the President-Elect. For such a post Mr. Hammond is particularly well fitted by his diplomatic skill, by his intimate knowledge of business affairs, and by his wide acquaintance among public men. This hearty endorsement of his merits for a position of such importance can be weighed against our conviction that he is not the man to be President of the Institute or the titular leader of our profession. As he has been twice selected for this honorable position, Mr. Hammond can afford to smile at this belated expression of our opinion. He is, *au fond*, not a professional man, but esentially a business man, as successful as he is capable. We hope Mr. Taft will make him Secretary of Commerce and Labor.

Analysis of the Election.

Mining engineers are citizens and as professional men they ought to be among the most intelligent of those having the rights of a citizen. A presidential election in the United States is an event of world-wide interest, as throwing light on the development of representative government in the most progressive of democratic countries. To those of our readers who live in America we can give but little new information, but to Americans and the friends of America in those distant lands to which this journal goes, we hope to offer comment that may prove interesting. Now that the dust of the campaign has subsided and the election returns have been analyzed, there are many features that stand out clearly. Mr. William H. Taft won because he was regarded as a man of good sense and strong character, he represented the dominant party, the party that is identified with the protective tariff, and the business interests of the country; he was also an exponent of the policies of Mr. Roosevelt, a President to whom it has been given in unusual degree to express the national spirit. For 12 years Mr. Bryan has been the safety-valve of popular unrest, he has advocated many reforms, not always consistently, and as he has led the Democratic attack on the Republican tariff, he has inevitably intimidated the protected interests and the large number of manufacturers who have grown rich under protection. But, on the surface, the tariff did not cut a big figure this time. Labor did. The leader of the labor organization supported Mr. Bryan, and an appeal was made to the labor vote, the chief effect of this move being to frighten the employers of labor without overcoming the idea of most laboring men that Mr. Taft's election would stimulate industrial activity and thus give them a better chance of employment. In other words, the average citizen voted for the candidate and the party whose administration seemed most likely to bring about a period of industrial prosperity, at least temporarily. Whether national or civic ideals are identical with prosperity in business affairs is a point it would be a waste of time to discuss. Most people agree with the British statesman who said that he would rather help the people to eat bacon than to read Bacon. We do not accept that dictum, but others do.

Apart from the victory of Mr. Roosevelt's nominee and the failure of the thrice-nominated Democratic orator, the most important feature of the election was the success of Mr. Charles E. Hughes, the Governor of New York, who was re-elected. This result is immensely encouraging to those who believe in the future of American civilization. A university graduate, and an accomplished lawyer, he became in 1905 the counsel for the legislative investigation that revealed the corrupt methods of the big insurance men, and he did his work so fairly and so unflinchingly that he was elected Governor in 1906. Since then he has given New York an excellent administration, refusing to take orders from the political bosses, vetoing measures he deemed unconstitutional while advocating reforms successfully. He has been safe and sane, he has exhibited integrity and intelligence, he has proved fearless and forceful. Although opposed bitterly by the party bosses, he was re-nominated and has now been elected in the face of an opposition that combined all the sinister influences within the State of New York. The antagonism of the machine politicians and the appeal of the Governor over their heads to the sound sense and good heart of the people of his State, has ended in the complete rout of the allied villainies of low politics, special privilege, and legislative corruption. Governor Hughes is a true democrat; he has taught the plain people that they are responsible for bad government; he has shown them how to get good government. Nothing in recent years can so hearten the believer in the successful outcome of this great experiment in representative government as the late events in New York. And there are other encouraging signs. At Denver the Judge of the Juvenile Court, Benjamin B. Lindsey, who has done splendid work in the reforming of children, has been elected, as an independent, in the teeth of opposition from both the regular political parties. In San Francisco the most interesting event was the election of the Judge who has presided in many of the graft cases. The choice lay between a judge who was not judicial in temperament but honest in character and another judge who was—a plain crook. It may seem strange that the result should have been in doubt. But it was. All the special interests, dominant corporations, predatory politicians, municipal thieves, and others endangered by the investigations of the graft prosecution joined hands to defeat the honest judge; but he was elected. Incidentally, it will not be improper to point out the absurdity of the method by which judges are chosen; it is anomalous for a

judge to have to go before the voters at a time when he is trying cases, the issues of which have cleft the community in twain. However, all is well that ends well. This applies to Mr. William R. Hearst, who is also ended. His rag doll of an Independence party has been practically wiped out. It cut no figure at all in this election. But Mr. Hearst managed to get a great deal of pleasant notoriety by reading letters proving that the agent of the Standard Oil Co. had bribed sundry senators and congressmen. As these letters must have been stolen, they suggest the character of the methods adopted by enterprising newspapers. While the exposures killed the political life of the men implicated, they did not affect the outcome of the election. One result is plain: The influence of blatant journalism is gone. Most thoughtful men are glad of it. In California the Taft wave carried with it into office the usual flotsam and jetsam of needy politicians and pliant tools of corporate corruption, but here, as in Colorado and in other States, the scratching of tickets proved that voters are beginning to think for themselves. The man who votes a straight ticket is a bone-head. It is one of the encouraging signs of the times that a big proportion of voters nowadays exercise the privilege of choice, so that a bad man on a good ticket may be defeated by a good man on a poor ticket. Thus Hughes was elected in 1906 when all the other nominees of his party were beaten by the Democratic candidates. Thus Democratic governors have been elected in States that gave Mr. Taft a big majority over Mr. Bryan. This evidence of individual thinking is a cheerful sign; another is the adoption—in several States—of the direct primary, with election of senators by popular vote. On every hand that oligarchy of corruption, the political machine, is being attacked successfully. Thus representative government develops.

Metal Markets.

As was anticipated eight or ten months ago, the metal market has revived notably, and purchases are now being made by manufacturers, who in turn are commencing to receive orders in larger volume than at any earlier period of the year. It has been remarkable what caution has been exhibited, despite cheap money; proof has not been wanting that while money was available for the best investments, it could not be had at any price for new enterprises, and especially not for speculative undertakings. During the three weeks preceding the election the East was fairly confident as to the result, but no one was prepared for a victory so decisive, and since the country has spoken so clearly, confidence is returning, and this is helping the metal trades. The position of copper, intrinsically, has been good since early this year, because the stocks accumulated during the panic had been fairly well absorbed, and the large buying from Europe had shown that with the materially reduced production conditions would soon improve, but American buyers, for reasons above stated, were not able or not willing to avail themselves of the low prices then ruling, and later on they feared that when production increased there would be no market for it. All this has proved a blunder, for not only are there no stocks here, but whatever is produced goes into consumption as soon as it is in a marketable state. It is true, abroad the visible supplies have been increased to nearly 60,000 tons, but, far from this being a bad factor, we believe it is a good one, as these are the only reserves existing, and they are easily financed by a number of people, so that at no time shall we have to fear that they will be dumped on the market suddenly, as might happen if the stocks were concentrated in one or two hands. Europe is taking enormous quantities of copper. The consumption over there must be phenomenal, and now that the turn has come here we find also that our home consumers cannot get enough, and a much larger business would have been done had prices not advanced so quickly. By this we do not mean that the end of the present movement is in sight. On the contrary, it looks now as though we would soon reach a stable 15-cent basis; this will be a boon to the mining interests that for the last eighteen months have struggled hard to make both ends meet. The outlook is certainly encouraging, and a great many new enterprises will undoubtedly now be started and will consume a great deal of copper. We refer elsewhere to the decision of the Pennsylvania Railroad to have its new New York branch electrified, commencing at Newark. Other railroads will no doubt soon follow. It may interest our readers to learn that the country most advanced in electrolyzing railroads is Switzerland, where about 25 per cent are actually so driven, mostly by power generated from water.

Consumption of lead during the summer months was extremely good, and the large accumulations had nearly all been disposed of, but prices having been pushed ahead too fast, a reaction set in during last month, when the demand for white lead fell off somewhat, and in consequence there was a reduction in the price from 4.60 to 4.30 cents at New York, but this will soon again be overcome, as there are more buyers than sellers. What is weighing on the market is Missouri lead, of which there is still some accumulation. Now, however, that the electrical industries will take larger quantities, these available stocks will soon be worked off. Spelter has remained behind in a most trying way, and during the first eight months of the year ruled from about 4.30 to 4.50 cents at St. Louis. This was a deplorable state for the smelters, who could not secure sufficient orders, except by paying for the zinc contained in the ore on the basis of 5 cents, a most unprofitable operation, as will be seen. Still, the low-grade ores from Colorado, Utah, New Mexico, and old Mexico left hardly anything to the miner after freight and treatment charges had been paid, even if he realized 5 cents. With much better buying on the part of galvanizers, prices have now come up to about 4⅞ cents and are likely soon to be over 5 cents, which will stimulate the production of ores and place the industry on a more settled basis. The iron and steel situation is mending from week to week, during the last fortnight large orders have been received, which will enable the mills to increase their output.

BY THE WAY.

*For the last two years the English people, if one might believe the sensational press, have been living in terror of something worse than the perennial French invasion, which only last year blocked the plan of a Dover-to-Calais tunnel. Is England disappearing? This is the question the London householder has supposedly been asking himself daily ever since July, 1906, when the *Sphere*, in a startling article, produced evidence to show that, while Britannia still ruled the waves, Ocean, the might monster, was silently achieving his revenge by destroying England herself. The cliffs at Dover and elsewhere were tumbling into the sea. Even in the memory of living men there were startling changes in the coast line. Was this silent destruction going on at a more rapid rate? Was the nation helpless before the forces of nature? These were the questions the *Sphere* suggested, with that unfailing result of every public outcry in England—the appointment of a Royal Commission on Coast Erosion, the Liberal Administration thus proving early in its career that its zeal for the safety of the King's subjects entitles it to their grateful suffrages.

The Commission has sat and done its duty as England expected it to do, and so thoroughly as to prove beyond cavil both the wisdom of the Liberal party and its own recognition of its sacred responsibility. In no less than 1034 pages it has reported its conclusion, which has enabled a whole country to breathe again—England is not vanishing. Tremendous as is the battering force of the sea; great as are its victories; astounding as are the changes in harbors and coasts since the days of the Armada; enormous as are the masses of rock and earth that daily fall into the water, the "tight little island" is not decreasing. Imperialists, with horrifying visions of a really 'little England,' may sleep again, and the rate-payers who feared an increase of at least a shilling in the pound to provide breakwaters and bulkheads, are now confident that they will, after all, be able to send their daughters to a year's 'finishing' in Switzerland. And the Premier, in the midst of his grave cares of state, has been heard to say, according to report: "Well, there's one thing they can't accuse me of: England isn't disappearing from the globe in my Ministry." More than that, he can "point with pride" to the Commission's report and say—after the manner of our own Republican party: "See, under our fostering Liberal care, England has not only grown better morally, spiritually, and financially, but has actually added, with God's help, it is true, at least six acres of land to the entail of England, Scotland, and Wales."

For this is what the Royal Commission has discovered. The summa summarum of its findings is that destruction by the sea and construction go hand in hand; briefly, that the constructive policy of the sea, as all such policies should, is winning in this contest of the ages. It found that there was plenty of truth in the *Sphere's* assertions; that, in fact, more striking and more alarming losses could be recorded than it had cited, but that the *Sphere* had overlooked the steady gains made by the land from the sea. The shifting sands do not disappear altogether, and are not lost forever. The process is clearly illustrated by the changes at the two lighthouses of South Foreland and Dungeness, near Dover. The former is on the cliffs, and near it the loss of land averages fully two feet per year. At the Dungeness Light precisely the reverse has happened. According to the records of Trinity House Corporation, this spit of land has grown out into the sea at the rate of three yards annually from 1797 until 1850; from then until 1871 at the increased rate of three and one-half yards, and since 1871 at nearly the old speed of three yards. Three times during the nineteenth century, the records show, was it necessary to move the lighthouse nearer to the sea because of the constant accretions of a gravel-like rubble.

At Spurn Head, at the mouth of the Humber, the process is even plainer, for it is to this point that the sea brings the lighter materials it has torn from the Holderness coast. Here the growth per year is as high as six yards—double that of the Channel coast—and it is steady and certain, despite the frequent alterations in the outline of the newly-made land. In protected harbors, too, the increase is constant, owing to the deposits of soil brought down by the rivers, and to matter carried in by the tide as a result of destruction at other points. As soon as the process has gone far enough the newly-made land is fenced or diked in and is at once available. In the Wash the great fens have been entirely created, in this manner, since the first breakwaters were constructed there in the seventeenth century by a Dutch engineer, Vermuyden. Indeed, after a careful comparison of the various coast-surveys of the last thirty to fifty years, the Commission is satisfied that the loss has been only about 760 acres in England and Wales, while the gain has been seven times that figure. For Scotland the gain has been a little less: in Ireland the ratio is about the same.

Britannia's conquest of the waves is, therefore, thoroughly secure. The Englishman who reads with alarm of such a town as Dunwich, now a mere village, while the city of twelve churches, once a bishop's seat, lies under the ever-approaching sea nearby, can comfort himself by repeating that, for every acre lost, seven are gained, and that new towns may spring up as the old ones disappear. His fears for the abiding place of his descendants of the twenty-fourth century are stilled. But the rate of growth of the island is still too slow, we fear, to lend itself to dreams of a greater England in the North Sea. During his lifetime Mark Twain will continue, when he sets out for a morning walk anywhere in England, to be haunted, as he has told us he now is, by the fear that if he is not careful he will fall off the edge into the water. To quote Davidson:

"Where argosies have wooed the breeze,
The simple sheep are feeding now:
And near and far across the bar
The ploughman whistles at the plough.
Where once the long waves washed the shore
Larks from their lowly lodgings soar."

*Re-printed from the New York *Evening Post*.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

ARTHUR WINSLOW is here.

COURTENAY DE KALB is at Salt Lake.

GELASIO CAETANI is at Treadwell, Alaska.

F. J. H. MERRILL is now at Nogales, Arizona.

J. PARKE CHANNING is at Copperhill, Tennessee.

F. L. BOSQUI has returned from Goldfield, Nevada.

F. W. BRADLEY has returned from his Northern trip.

W. A. HEYWOOD has returned to London from Chile.

A. E. FIREBRACE left London for Chile on October 23.

EDWARD SIMPSON has arrived in Tacoma from Dawson.

A. G. SHAKELFORD, of Juneau, was in San Francisco recently.

HUGH F. MARRIOTT has returned to London after visiting Canada.

JOHN E. WILLIAMS was at Los Angeles and is now at Pittsburg.

HIRAM W. HIXON sailed for London from Philadelphia on November 7.

WALTER PETHYBRIDGE has returned to London from Okotsk, Siberia.

ALLAN H. ROGERS is going to examine the Braden copper mines, in Bolivia.

ARTHUR S. DWIGHT is examining a copper mine in Shasta county, California.

F. L. Slocum, of Pittsburg, has recently been at Parral and Chihuahua, Mexico.

DONALD B. GILLIES, president of the San Toy Mining Co., is at Chihuahua, Mexico.

C. W. WHITLEY, the Salt Lake manager for the A. S. & R. Co., was at Reno this week.

R. S. BOTSFORD has returned to London, after having paid a professional visit to Chile.

ELWYN W. STEBBINS has returned from examining mines in Sierra county, California.

J. LANGELOTH, of the American Metal Co., has returned to New York from British Columbia.

EDWIN J. WATSON, of the Yukon Basin Gold Dredging Co., has returned from Dawson to Berkeley.

C. FRED THOMAS, for many years manager of South Crofty mine, in Cornwall, has sailed for South Africa.

G. B. JACOBS and JULIO POSADA, mining and metallurgical engineers, have opened an office at Chihuahua, Mexico.

W. H. PAUL, manager for the Dolores Mines Co., Madera, Chihuahua, has returned to the property from New York.

HENRY F. COLLINS has resigned as manager of the Cerro Muriano mines, in Spain, and is now at Crinnis, in Cornwall.

CHARLES A. PRINGLE, manager of the Calera mine, at Isédro, Chihuahua, Mexico, has returned from a visit to the United States.

CORTLANDT E. PALMER has moved his office to 71 Broadway, New York, where he will have quarters jointly with Mr. Hammond.

T. LANE CARTER, of Johannesburg, spoke to the mining students of the University of California on the mining and metallurgical practice of the Rand.

Obituary.

H. P. SEALE, assistant manager of the Mt. Morgan mine, Queensland, died in September. He was only 36 years old, a native of New South Wales, and a graduate from Sydney University. A few years ago he visited the United States in company with G. A. Richard, the manager of the Mt. Morgan, and both of them made many friends.

Latest Market Reports.

LOCAL METAL PRICES—November 12.

Antimony	12@16c	Quicksilver (flask)	$44@45
Casting Copper (scrap)	8¼@13½c	Spelter	6¼@7c
Pig Lead	4.55@5.50c	Tin	32@33¼c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Nov. 5. £. s. d.	Nov. 12. £. s. d.
Camp Bird	0 15 0	0 15 9
El Oro	1 3 9	1 5 0
Esperanza	3 2 6	3 8 9
Dolores	1 10 0	1 10 0
Oroville Dredging	0 9 0	0 8 9
Stratton's Independence	0 1 3	0 1 3
Tomboy	1 1 3	1 1 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Nov. 6	13.93	4.38	4.98	50⅛
" 7	14.06	4.38	4.98	50
" 8	Sunday.	No market.		
" 9	14.12	4.38	4.98	49⅝
" 10	14.31	4.38	5.01	49⅞
" 11	14.31	4.38	5.03	50⅛
" 12	14.31	4.38	5.03	50

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Nov. 5.	Nov. 12.
Amalgamated Copper	83¼	86½
American Smelting & Refining Co.	94¾	96
Boston Copper	14½	17¾
Butte Coalition	27½	27⅞
Cumberland Ely	8¼	8¾
Dolores	7½	7½
El Rayo	4	4⅛
Giroux	4	4⅜
Greene-Cananea	11½	11⅞
Indiana Sonora	4¾	4⅞
La Rose	6¾	6 15/16
Miami Copper	12⅜	12⅞
Nevada Consolidated	18½	19⅞
Newhouse	5	6¼
Nipissing	10⅞	11
Ohio Copper	4½	4½
Tennessee Copper	44⅛	48⅜
Utah Copper	43¾	50⅝
Yukon	4½	4¼

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, November 12.

Atlanta	$ 24	Laguna	$ 1.10
Belmont	1.17½	MacNamara	54
Booth	33	Manhattan Con	7
Columbia Mtn	18	Midway	26
Combination Fraction	1.30	Montana Tonopah	70
Daisy	1.02½	Nevada Hills	1.50
Fairview Eagle	35	Rawhide Queen	65
Florence	4.27½	Sandstorm	23
Gold Bar (Bullfrog)	3	Silver Pick	15
Goldfield Con	6.67½	St. Ives	25
Gold Kewenas	26	Tonopah Extension	60
Great Bend	36	Tonopah of Nevada	6.90
Jim Butler	24	Tramp Con	15
Jumbo Extension	32	West End	53

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. November 12.		Closing prices. November 12.
Adventure	9	Mohawk	65
Ahmeek	115	Nevada Con	19⅞
Allouez	40½	North Butte	87¾
Amalgamated	86¾	Old Dominion	58⅜
Arcadian	5	Osceola	123
Atlantic	18½	Parrot	28½
Boston Con	17⅞	Quincy	98
Butte Coalition	27⅞	Rhode Island	5
Calumet & Arizona	125½	Santa Fe	2⅜
Calumet & Hecla	690	Shannon	18¾
Centennial	35¼	Superior & Pittsburg	19⅜
Copper Range	81½	Tamarack	86
Daly-West	10½	Trinity	19
Franklin	15	United Copper Con	15¼
Granby	100	Utah Copper	48⅛
Greene-Cananea, ctf	11¾	Victoria	5¼
Isle Royale	23¾	Winona	6½
Mass	4⅛	Wolverine	153

General Mining News.

ALASKA.

Dispatches from Dawson indicate that the Bear Creek dredge was still running the last week in October and that four drills were working night and day. The frost has been heavy and it was with great difficulty that the riffles were kept clear of ice. Fred Rothschild and Charles Maass, manager and superintendent, have gone 'outside.' Harold Brown is in charge.——The famous Barnette-Causten case has been settled out of court, but the exact terms have not been made public. The whole controversy hinges on an agreement between Barnette and Smith on one side and J. H. Causten on the other made on August 6, 1901, whereby the latter furnished Barnette and Smith the money to carry out a scheme to establish a trading post at what is now Fairbanks. Barnette later purchased the interests of Smith and has since made a success of the original and several other ventures, among which are the Fairbanks Banking Co. and the Gold Bar Lumber Co. Causten claims that the agreement of 1901 was a partnership contract, and that under it he is entitled to a one-third interest in the enterprises. It is believed that by the terms of settlement he received less than $40,000.——Two new beach lines have been discovered near Fort Davis, three miles southwest of Nome. They lie between what was formerly called the second and third beach lines, the bedrock of one being at the same elevation as the old third beach line, but divided from the sea by rising ground that is higher than anything found between tidewater and pay-gravel in other places. The second beach line pans from 7c. to $1, while the third runs only 2 to 5c.——Frank Kernana has returned to Seattle from Valdez and brought with him more than $100,000 in gold dust, the result of the season's operation of his hydraulic mine in the Nizina region, far up the Copper river. He stopped operations on September 1, but says he could have continued longer if he had had men to work.——The Burks steam conveyor, on No. 21 Below on Hunker, has shut down for the winter, after a successful season. The conveyor dug out an open-cut 140 by 100 ft., working thawed ground and skimming along the edge of the frozen ground. The depth there is 27 ft. The company plans to thaw some of its ground. A team will make one round trip per day between the conveyor and the place where the wood is cut.

ARIZONA.

GILA COUNTY.

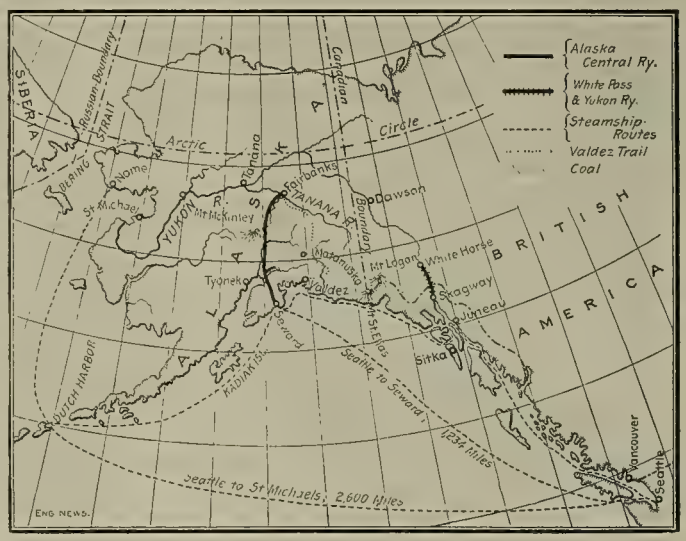
(Special Correspondence).—The Arizona Commercial Co., at Globe, has resumed work on the old incline shaft of the Blackhawk mine. Preparations have been in progress for some time to open an intermediate level below the fifth level, at a depth of about 450 ft., which will correspond with the 480-ft. level of the Great Eastern mine. The vein at that level in the Black Hawk property is 25 ft. wide and a drift will be started toward the west on a face of 7% ore.——The Eureka shaft, nearly 1000 ft. west of the old workings, is down 55 ft. below the 600-ft. level. The work is in well mineralized rock, showing some carbonate of copper, and the work for the past week has developed a better flow of water. The Black Hawk vein carries the best ore on the foot-wall and it is probable that the Eureka shaft has not yet penetrated the vein far enough to develop payable ore. At 700 ft., which will be reached near the end of the month, another level will be opened and a cross-cut started toward the vein. The pumps will soon begin to drain the Black Hawk workings and work will be resumed, sinking below the present water-level at the old shaft.——Good sulphides have been struck on the 1200-ft. level of the Mallory mine. The discovery of the new vein was made in the west drift.

Phoenix, November 7.

MOHAVE COUNTY.

The large water-tank formerly used by the Santa Fe, at Kingman, has been taken down and will be erected at the Bi-Metal mines three miles south of that town.——George Johnson and Fred Stull, of Chloride, have gone to the Treasure Hill district, where they will do assessment work on the Nora mine, formerly the Mocking Bird. This mine has been one of the rich mines of that vicinity and the miners expect to take out enough ore to pay them well while doing the annual work. Last year nearly one thousand dollars worth of ore was taken out while doing the work.

Operations are to be started at the Nighthawk mine, at Layne Springs. The mine is under bond to the Nighthawk Mining Co., of which Thomas M. Purman is general manager.——The shaft of the Golden Gem mine is now 530 ft. deep and at the 524-ft. mark cut a body of 10-oz. gold ore which seems to be a promising vein. A depth of 600 ft. will be made before cross-cutting is started. O. F. Kuencer is superintendent.



Map of Alaska.

YUMA COUNTY.

Sinking has been temporarily suspended in the shaft of the Big Stick Co., in the Santa Maria district, on account of striking water at the 250-ft. point. A pump is being put in at the 200-ft. level.——Work will be resumed on the construction of the mill at once, and it will be turning out bullion and concentrate soon, as the intention now is to rush the work to completion. The Big Stick group, comprising 12 claims, is 20 miles northwest of Date Creek station.——The Clara Con. G. & C. M. Co. has secured the services of James Stirling to make a complete geological and topographic survey of its property in the Santa Maria district. Three shifts are at work in both the No. 1 and 3 shafts, and the adit on the Morro claim is now in 200 ft. A smelter is to be built at once and five carloads of machinery have already been shipped from Globe. George Mitchell is general manager.

CALIFORNIA.

ELDORADO COUNTY.

A company of Georgetown men, headed by D. B. Craig, has leased the old Fort Hill placer mine near Georgetown and is making preparations to start work.——The Hume mine, in the Mother Lode belt, is being worked by the Garden Valley Gold Mining Co. An incline shaft has been sunk to a depth of 85 ft. and pay-ore found at 40 ft. A drift is now being run from the 85-ft. point to strike the

same shoot. Steam-power is used and three shifts are working. J. F. Mullender is manager.——Wingfield and Nixon are operating the Alpine mine and are sinking the incline shaft, which is now below the 400-ft. mark. C. G. Johnson is superintendent.

NEVADA COUNTY.

(Special Correspondence).—A six-foot vein has been intersected in the adit at the Rose Hill. It is supposed to be the Dromedary vein. The bore has been cleaned up for a distance of 200 ft.——At the Champion a north drift from the 600-ft. and a south drift from the 1100-ft. levels are being driven. The company is taking ore from a drift on the 800-ft. level. Several groups of tributers are also working.——The North Star mines have been supplied with more water and the big hoist is again operated by water-power. ——The Murchie expects to resume operations this week with about 20 men. The mill will be started as soon as the ore-bins are full. Henry Fitter is superintendent.—— The new hoist has arrived at the Greystone mine and will be immediately placed. Two shafts are being sunk on promising veins.——The 250-ft. adit at the LeDuc has cut a vein of fair-grade ore. Development is progressing.—— Arrangements are being made for the installation of a compressor, 75-hp. motor, and four concentrators at the Central Con. mine. The main adit is in 1400 ft. Several veins running from 8 to 14 ft. wide have been intersected by the adit. The adit is being continued to cut the old gravel channel. Twenty stamps will soon be dropping. C. N. Bailey is manager.——Gravel mining above Camptonville promises to be active this winter. The Indian Hill, Brandy City, and Depot Hill companies are constructing restraining barriers across the streams.

Grass Valley, November 9.

PLUMAS COUNTY.

A strike of $30 ore has been made in the Gruss mine near Genesee. A body of $10 ore, four feet wide, has also been opened at another place. It is said that machine drills and compressors will be put in.——The old Crescent mine, near Crescent Mills, is to be re-opened by the heirs of James McDonald. The property has been idle for a number of years because the ownership was invested in an estate.

SIERRA COUNTY.

John Mayer and Jack Crossman are doing assessment work on their claim in Black's canyon, a branch of Ladies canyon. They are fixing the ground up preparatory to working next spring.——J. M. Shinn, of the Packer Canyon Mining Co., above Sierra City, has closed the mine for the winter and returned to his home in New York. When he returns in the spring he will continue the main working adit.——The complete material for an aerial tramway has been shipped for the Gray Eagle mine at Gold Point. As soon as it arrives a crew of men will begin its erection and the company hopes to have it in running order before snow flies. A new set of plates have been installed in the mill. ——The new wagon-road nine miles long, which connects Camptonville with Snowdon hill, was finished recently, simultaneously with the completion of several extensive surface improvements on the Snowdon Hill drift mine, including the construction of another road seven miles long to the Mountain House, a telephone line to the latter station, a ditch seven miles long, and a number of new buildings at the mine which was formerly known as the Jerry Watts. The buildings are models, up-to-date in appointments including the superintendent's residence, boarding-house, dormitory, and store-house. The whole has been accomplished at an outlay of $21,000 and was begun last July. Superintendent L. C. Heller will push the bedrock adit, now in 150 ft., to a point 150 farther on before making a raise to gravel.

TUOLUMNE COUNTY.

McCormick & Co. and Cotton Bros., owners of the Draper mine, have a small force engaged in cleaning out and retimbering the main shaft, which had caved in to the first level. It is the intention to get everything in shape and drive a cross-cut to the vein at the 600-ft. level. Richard A. Nicholls is superintendent.——At the Ethel, in the Columbia district, several hundred tons of ore are ready for crushing, and it is claimed that all of it will yield more than $20 per ton, besides giving a good percentage of concentrate. Superintendent Remington is pushing work at all points and expects to have a crushing plant in operation soon.——It has been reported that a company of San Francisco capitalists has been organized to develop the Wheal Rough, near Soulsbyville. This is a property that has at all times been rated as one having a splendid vein of milling ore.——Three men are employed in clearing rubbish from the tunnel of the Over, near Saw Mill Flat. There will follow a thorough re-timbering and then a search for the pocket leads. Charles Peterson is superintendent and owner.——The Birney, at Saw Mill Flat, has been leased by Ray Fulcher and associates, who will begin operations at once. The mine is in the midst of the pocket properties and has produced thousands of dollars.——The Morning Beauty mine, west of the Riverside, has been bought by W. P. Cox, of Robinson Ferry, from F. G. Gross and John Beadle.

COLORADO.

CLEAR CREEK COUNTY.

The Bonnie Brier M. & M. Co. is planning the installation of a 12-hp. hoist on its property in the Alice district. Robert Nimmo, of Cincinnati, is president of the Company and was recently at the property making an inspection.—— Operations have been resumed on the Cumberland mine and the shaft is being unwatered. A. V. Dickson is manager. ——The Mammoth mine, situated on Brown Mtn., a producer in early days, has been taken under lease by B. J. Martelon, of Silver Plume, and arrangements are now being perfected for extensive development. A number of capitalists have become interested and funds are promised for extensive operations.——The Big Indian Mining Co., composed of Denver men, has been incorporated and has secured a three years' lease on the Ajax or Big Indian claim on Leavenworth Mtn. Work is to be started at once.—— Just & Glasson, leasing on the upper Frostberg, have uncovered a body of heavy lead ore that measures fully two feet wide. The discovery was made where the Paymaster and Mendota veins meet, and indications are that one of the old-time bonanza strikes has been made, for which the Mendota was famous a few years ago.

GILPIN COUNTY.

The strike recently made in the Quartz Mill mine in Leavenworth gulch of the Russell district is improving all the time. The shaft is now 420 ft. deep and will be sent to the 500-ft. level before driving is started. The property is owned by the Bezant Gold Mining Co., in which Eastern and Denver people are interested. O. J. Duffield, of Denver, is manager, and J. H. Bawden is superintendent.——The Cherokee M. & R. Co. is operating the Wise Boy property in Lump gulch and has an adit in 125 ft. C. D. Laing, of Gilpin, is manager.——Denver people have purchased the Ipava and Populist claims in the Central district and they have arranged for the purchase of a plant of machinery near Eldora, which will be installed as soon as delivered from that camp. The property includes two lode claims and a mill-site. It was owned by Peter Petersen and has produced some fair-grade ore, considering its surface developments.——A complete plant of machinery, consisting of an engine, boiler, and air-compressor, is to be installed by George Stroehle & Sons at the Smuggler mine of the A. K. R. Gold Mining Co., in Moon gulch. The property has been making an excellent record in production for several months and Manager Ashmore announces that they will add five more stamps to their present milling capacity. ——A 40-hp. boiler was delivered to the Hall mine in Russell gulch last week and is now being installed. The property has been taken over by John Stewart, who has given instructions to commence sinking as soon as the plant is in shape.

GUNNISON COUNTY.

Operations are to be started soon on the Northpole mine, in the Rock Creek district, and continued all winter. Sup-

plies are now being taken to the property. Most of the stock is owned in Boston, Porter Nelson, of Aspen, being the largest Colorado stockholder.——The management of the Mountain King mine is purchasing supplies for the winter's run. When the vein is struck, driving in both directions will be started. A concentrating plant is one of the future improvements planned.——Robert Harper, owner of the Brooklyn properties on Galena Mtn., has stopped work for this season. It is understood that the last work done this season uncovered some good ore which will be developed extensively early next season. The mine is equipped with a steam plant and air-drills.

TELLER COUNTY.

A company of Iowa men has leased the Four Brothers claim, on Beason hill at Cripple Creek, and will, it is said, start operations soon.——D. H. Harris and associates, who recently secured a lease on the north 500 ft. of the Moonlight claim on Gold hill, owned by the Missouri Mining Co. have commenced operations through the Good Will adit. The bore intersects the leasing blocks at an approximate depth of 450 ft., and at this depth the lessees are driving on a well defined vein. The ore mined at present is low-milling grade, but it is the intention of the management to continue the drift forward to its intersection with a cross-vein exposed in near-by workings, where it is expected a richer body will be entered.——The output made from

Smuggler, Colorado.

the properties of the Vindicator Consolidated Gold Mining Co. for October amounted to approximately 3000 tons of graded ore, ranging in value from $10 to $20 per ton, for coarse quartz to $50 per ton for the screening and fine. In addition to the work carried on at the main shaft and elsewhere on Company account, five sets of lessees are producing from the original holdings, with 15 sets of lease operators engaged in the development of the 40 acres acquired from the Independence Con. Gold Mining Co., and better known as the Hull City placer, situated within the town of Independence on Gull hill.——The output of the Cripple Creek mines for the month of October amounted to $1,467,484 from 63,720 tons of ore. In point of bullion value October was the banner month of the year, but in amount of tonnage the figure is not as large as previous ones. As usual the Golden Cycle heads the list, the gross value of its output being $657,800; the A. S. R. & R. Co. is second with $322,300.

IDAHO.

IDAHO COUNTY.

J. F. Thorn, superintendent of the Buster mine, near Elk City, has returned from Newsome, where he let a contract for 100 ft. of adit on the Mackey mining property, which has been taken under bond by men interested in the Buster mine. The property is one of the most promising in central Idaho. There is a 300-ft. adit which cuts two veins of exceptionally high-grade free-milling ore. Those interested in the bond are F. W. Bradley, J. H. Mackenzie, and Mark L. Requa, of San Francisco. The property is 12 miles from Newsome station, and one and a half miles from the proposed electric railway along the south fork of the Clearwater river.—J. R. Hutcheson, manager of the Twin Butte mine, in the Orogrande district, reports that the company will install two mills this winter as auxiliary to the roll-mill now on the property. A recent strike in the mine carries ore that assays over $20, and the outcrop has been assayed for a distance of 2000 ft., and the average assay is a little over $3.——William A. Russell has bought a one-fourth interest in the Simms placer property, consisting of four claims on Little Elk creek. The property will be supplied with hydraulic equipment and worked extensively next spring.

SHOSHONE COUNTY.

(Special Correspondence).—Mining throughout the Coeur d'Alene district has been practically at a standstill owing to the election. The county has again gone Republican, more on account of fear of any alteration of the present lead tariff than anything else. The chief feature, however, as far as local industry is concerned, has been the election of Fred Cushing Moore, a Wallace engineer, to the office of State mining inspector by a handsome majority. Mr. Moore is well known throughout the district and it is believed that he will make a worthy successor to Robert N. Bell, whose work has done more for Idaho in this connection than any man who ever held the office.——The Bunker Hill & Sullivan Co. has declared its 134th dividend. This involves the distribution of $75,000 for the month of November and brings up the total disbursed by the Company to $10,590,000, of which $780,000 has been paid this year. The new mill at this property, which will give it a capacity of 2000 tons is now well on toward completion and will mean the employment of practically 1000 men in the mine. In view of this, vast ore reserves have been opened up and new territory entered and explored. On the Sullivan side of the mine extensive orebodies have been tapped, while the recently opened Morgan stope has exposed an ore-shoot that far exceeded the most sanguine hopes of the management.——Ore running as high as 17% copper, $14 in gold, and $3.57 in silver has been found in the property of the Birthday group of claims in the Grand Forks district, owned by W. J. Horesky. The property has been developed by means of three adits, the last of which has only been driven about 40 ft. The vein has been proved to be six feet wide, of which two feet is of high-grade carbonate ore.——A strike of ore carrying all the way from 1000 to 2000 oz. of silver has been made on the property of the Butte & Couer d'Alene mine. This ore is gray copper and up to the present time no less than three feet of it has been exposed, in addition to large quantities of milling ore. The strike was made at a distance of 165 ft. from the mouth of the adit. Already several cars are ready for shipment. The ore will be sent to the Panhandle smelter at Ponderay. Some of the ore is practically pure silver and in chunks weighing from two to three pounds. The property has been operated only about one year, but the owners claim that they have already 350 ft. of stoping ground and that by a continuation of the drift they can get a depth of about 1000 ft. A large equipment of machinery has been ordered for the property, including a hoist.

Wallace, November 9.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The past fortnight has noted several important strikes in this district. At Knights Station, while drilling a well, ore was found at 115 ft. and 10 ft. of galena was penetrated. At 200 ft. the drill entered rich ore, which continued for 25 ft. The strike is about a mile from the Lone Star and Magnet mines, good producers for some time.——At Purcell, near the Alba camp, a 15-ft. face of coal was recently opened up which is said to be high grade. The run will be further developed. A rich coal deposit has been worked for three years at Alba by Arba Green. The coal is of a better grade than is shipped in from Kansas. This Alba deposit is being further opened

up to supply the local trade.——Newman & McKee have been sinking a shaft in West Hollow, in the Joplin camp, and have opened up a deposit of galena and zinc-blende at 40 ft. carrying a 12-ft. face. A barren flint run was then entered, but the shaft struck ore bearing dirt at a lower level. The upper level will be developed as soon as the shaft is completed and the lower run will be further opened when the upper is worked.——Short & Co. have taken over the old Lincoln mine, at Zincite, and after further sinking have discovered a rich run of ore beneath the old drifts. The old workings caved in. Former operations were conducted at 104 ft., while the present shaft is down 128 ft. The vein of ore is three feet wide and some of it will assay 65% zinc.——The management of the Goode mine, north of Webb City, has sunk the two shafts deeper and opened up a richer vein of ore below the old drifts. In the north shaft a larger per cent of galena is being taken out than formerly. A 12-ft. stope is being carried in both shafts. Adjoining the Goode on the west the Robertson mines are opening the same run of ore. A shaft is being sunk on the drill-hole, which is down to the 60-ft. level. One shaft is already into the ore and the two will later be connected by drifts.——The Snapping Turtle mine, at Carthage, has ben producing for two weeks, the first time in over 20 years. The Turtle shaft is down 60 ft., at which point driving was done in good ore.——The Morning Hour, one of the large producers in the southwest part of Joplin, is pumping preparatory to re-opening. A large modern mill is on the lease. Considerable difficulty has been experienced by the company with cave-ins. Two serious ones occurred, one undermining the tracks of the electric line and the Frisco railroad. The ground has been strengthened and is now pronounced safe.——Poor Man's gulch, in the northwest part of Joplin, is to be re-opened by Chenoweth, Brown & Swarens. This tract has many shafts, all above the 100-ft. level, where shallow gouges were made for galena in the early days. The new company will lease a portion of the ground and will build a mill at the mouth of the hollow, so that all the ore taken from the tract can be trammed down hill to the mill for treatment. The upper runs will be worked first and the dumps still rich in ore will be run over the mill. The lower levels will be exploited later.——Old Jackson Hollow southwest of Joplin is being revived. Matthes Bros. have opened a run of ore from 140 to 150 ft., while former operations were conducted above 100 ft. A mill of 400 tons capacity is to be erected at once. The mill is being removed from a lease owned by these same men in the Duenweg camp.——The Morgan 'forty' north of Carterville is being re-opened by S. Y. Ramage. A 200-ton mill is on the property. The land is known as one of the best producers belonging to the Center Creek Co.——The Highland mine, belonging to the United Zinc Co., in the Duenweg camp, is to resume operations at once. The property closed down a year ago when the panic came and the practically new mill has been operated only a short time. The Company has a shaft into sheet ore at 252 ft.

Joplin, November 5.

NEVADA.

ESMERALDA COUNTY.

Three Goldfield leases declared dividends last week, the Consolidated Red Top distributing two cents per share, the Mohawk Jumbo three cents, and the Engineers' lease a total of $180,000. The latter has distributed to date $555,000.——The directors of the Red Top Fraction Mining Co. have decided to resume work about November 15. The shaft is now 360 ft. deep, but the management intends to sink to the 500-ft. level before cross-cutting. James E. Power is president and Frank P. Marisch is engineer.——There are six sets of lessees working on the Frances Gold Mountain, at Hornsilver. Ore is being sacked from one lease, and the others have good showings. This property, which is the Royal Flush group, has recently been given the name of the Lost Breyfogle Reclaimed, as some very old implements, including hammers, heavy steel and old copper-headed tamping-sticks have been unearthed, along with some specimen ore running as high as $44 per pound.——The Silver Pick Con. M. & S. Co., of Goldfield, has secured a lease on block 7 of the Deyling claim of the Silver King estate, at Hornsilver, and will start work at once. Sinking will be continued in the shaft, which is down 110 ft., and the 200-ft. point will be reached as soon as possible, from which level the veins will be prospected. It is the intention of the Company to install a gasoline hoist, perhaps within 60 days.——M. M. Detch and associates have installed a hoist on the Wilson lease on the Grizzly Bear claim of the Jumbo, at Goldfield. The shaft is now 110 ft. deep.——A strike of $200 free-gold ore at McLean, on the railroad 25 miles west of Tonopah, has caused a small stampede.——The mines of Goldfield produced during the week ending November 7 a total of $130,000, compared with $86,000 for the previous week.

HUMBOLDT COUNTY.

In pushing work on a lease on the Gee Whiz No. 1, at Chafey, in the vicinity of the Auld Lang Syne, an 8-in. streak of fine galena ore has opened up to 16 in., and the orebody is seemingly improving with depth. The Gee Whiz is owned by the Utahna Mining & Milling Co., of which H. S. Bixby is the president.——Frank T. Caley & Co., composed of some of the best known Colorado mining men, has secured a lease and bond on the Seven Troughs Buckhorn Mining Co.'s property near the town of Vernon and has commenced a vigorous campaign of development.

LINCOLN COUNTY.

The New Era group, including a 10-stamp mill, east of Searchlight, has been sold to Fred Holland, of New York, by the New Era Mining Co. De Berry & Megede, leasing on the property, have been working a vein, only 6 to 16 in. wide, which outcropped close to a well traveled path between the blacksmith shop and the camp houses, and had been overlooked for nearly ten years. The ore contains free gold and is said to be very rich. The lessees have sold their rights to the new owners.——A high-power pump is being put in at the tenth level of the mine of the Quartette Mining Co., at Searchlight, to enable exploration for the orebodies at greater depth and to provide additional water for the milling operations. Thirty to thirty-five stamps are running, handling 100 tons of ore per day.——The management of the new Santa Barbara smelter announces that it will be in the market for the purchase of ores about the last of November.——The Jupiter G. & C. M. Co. will start work soon. G. Eustice, who is manager, is building a residence on the property, which he will occupy when completed.——The Alunite Mining Co. is now cross-cutting at the 150-ft. level of its No. 1 shaft, and shaft No. 2 is 65 ft. deep. Two other shafts are down 40 and 25 ft., respectively. Another gasoline-hoist has been ordered. Robert T. Hill is now on the ground, giving his personal attention to details.

NYE COUNTY.

The Johnnie M. & M. Co., recently organized by A. D. Myers and T. A. Johnson to work the Johnnie Consolidated mine, has purchased a new 100-ton crusher, belt-conveyors, and has made numerous minor improvements around the plant. It is thought that within 60 days the mill will be treating 100 tons per day.——The Liberty mine, 22 miles north of Tonopah, has started operations. The Cramps, the famous shipbuilders, are the principal owners.——Samuel Newhouse has purchased the Silver Peak-Valcalda property, in the Silver Peak district, and will, it is said, increase the capacity of the mill to 200 tons. M. M. Johnson will have charge of the operations.——Arrangements are being completed to start the mill of the Round Mountain Reduction Co., under new management, by George A. Anderson, of Denver. Some new machinery will be installed, additional water facilities secured, and a re-adjustment of rates made to enable the handling of a larger quantity of ore.——The mines of Tonopah produced, during the week ending November 7, a total of 5318 tons, of an estimated value of $137,025.

NEW MEXICO.

The Vera Cruz Mining Co., operating at Nogal, in Lincoln

county, is installing a 200-ton cyanide plant, to treat the gold and silver ore from its mine on Vera Cruz Mtn. The ore is a poryhyry-conglomerate and is low-grade. It is mined from adits and open-cuts. L. C. Barlow, manager, states that the plant will be operating in 60 days.——The new concentrator of the Ocean Wave Mining Co. will be started up about the middle of November. The Company has been shipping only first-class ore heretofore, and has built the mill to treat the accumulation of concentrating ore. Robert Linton is general manager. The mine is at Hermosa, Sierra county.

CANADA.

BRITISH COLUMBIA.

The Dominion Copper Co., of New York, is in court at Grand Forks for permission to borrow $20,000 for the purpose of protecting its property during the process of reorganization. P. F. Rossa, general manager, who was recently appointed receiver and later provisional liquidator, is seeking this additional power from the Court. The assets are far in excess of its liabilities, the properties being estimated to be worth $2,000,000, but the Company is in need of the ready cash. The trustee for the bondholders is the National Trust Co., of Toronto. The money is to pay off the men, and also to retain a few men to keep the water out of the mine until the new company takes charge.——John Keough, of Colville, Wash., announces that a concentrator, crusher, and other machinery will be installed on the Keough property in the Colville district, 12 miles northeast of Boundary. An arrastre was installed last spring, but did not prove satisfactory in saving galena and telluride ores. While the quarz in the vein is not of great width, the slate surrounding carries gold enough to be payable.——The boiler and compressor plant of the Dominion Copper Co.'s Stemwinder mine were shipped to Moyie last week, having been sold to the owners of the Aurora mine, in which property it will be installed. The Dominion's new air-compressor is sufficient to supply all the properties here.——H. Lewiston, manager of the Queen mine on Sheep creek, recently took to Nelson a gold brick valued at $7000, the result of the clean-up of the free-milling ore of the mine. The output of the mine has been increased from 185 to 400 tons per week by doubling the number of stamps in the mill.——Following is the ore tonnage shipped from and crushed at the mines of Rossland for the week ending October 31: Centre Star, 3880; Le Roi, 1925; Le Roi No. 2, 350; St. Elmo, 35; I X L, 3; total, 6193 tons.

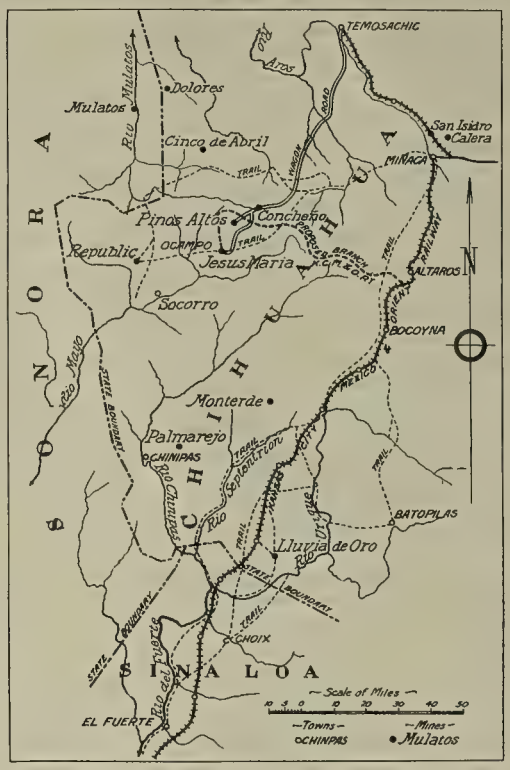
YUKON TERRITORY.

Henderson and Forkes have recently returned to Dawson from a prospecting trip up the McMillan river, a tributary of the Pelley. They say that while they found gold in almost every creek, the country is not attractive for hydraulic mining because there are too many large boulders. ——The Davison dredge, near the mouth of Forty-Mile creek, has closed for the season, and Frank Davison, manager, and Billy Moore, dredge-master, have arrived in Dawson. The dredge has had a successful season and the company is planning to ship one or more dredges to the Forty-Mile next season. The Davison dredges will have the advantage of being able to float from Whitehorse down the Yukon and up the Forty-Mile direct to the ground on which they are to be worked.

MEXICO.

CHIHUAHUA.

(Special Correspondence).—The property of the Rio Tinto Copper Co., at Terrazas, formerly owned by Juan Creel and associates, has passed to the control of Corrigan, McKinney & Co., of Cleveland, Ohio, who already owned the San Rafael mine and have since added the Columbia to their holdings. Since acquiring these properties the Company has placed R. R. Hutchinson in charge as manager and commenced mining operations. In the meantime a new 300-ton copper furnace, 42 by 192 in., with 12 tuyeres on each side, has been installed at the old plant and other equipment put in order, and it is announced that the furnace will be blown in by December 15. The intention is to take in some custom ore to add to the output of their own mines. The main part of this district consists of a copper zone in a limestone country, with a body of greenstone which has come up through lime. The copper ore, comprizing oxide and carbonate, occurs in irregular deposits on and adjacent to the contact of lime and greenstone, the mineralization extending into both, and along the strike of the contact. In some places the ore is entirely in the greenstone. The main orebody is said to extend 600 metres in length and to have a width of 3 to 40 ft. Tre ore runs 4 to 4½% copper and contains 2½ oz. silver and 25c. gold. There are porphyry dikes running through this lime country, in one of which is a body of iron sulphide which has been well opened. This will be of use in making the requisite smelting mixture. This sulphide carries one-half per cent iron. Farther to the northwest is a parallel lead belt, partly developed, showing both galena and lead carbonate. Between the smelter site and the main mine



Map of Southwestern Chihuahua.

workings is a low mountain ridge, through which a 1400-ft. tunnel has been driven, and a 36-in. gauge railroad has been extended from the smelter through this tunnel to the several shafts, making a mile of track. There are seven shafts, one having a steam hoist and the others gasoline hoists, the San Rafael, San Martin, and Columbia being the principal ones. The San Rafael is 440 ft. deep, and from it a cross-cut has been driven 1000 ft. southerly to cut the ore in the main body. Mr. Hutchinson was formerly at the Conchino mine, west of Miñaca, and H. J. Schneider, smelter superintendent, and M. D. Murray, mine superintendent, were connected with the Rio Tinto under David Goodale's management.——Felix McDonald, who owned and sold several of the properties in Terrazas district, still has important holdings here. His Americano mine is under option to T. N. Barnsdall, of Pittsburg, who has invested heavily in Atlanta, Idaho, and in Pinos Altos, in western Chihuahua. The Americano is a lead mine, having some silver and gold. It lies farther northeast and is on a belt parallel to the Rio Tinto. Mr. McDonald thinks work will be resumed on the Americano next year.

Terrazas, November 5.

Special Correspondence.

SALT LAKE, UTAH.

Important Improvement in Fume Condensation. — Neutralizing Sulphur Gases. — Details of Method. — New Converter Roaster.— Sintering the Ore.

The United States Smelting, Mining & Refining Co. has just made public announcement of the perfection of its process for elimination of injurious fume from its smelter gases. Experiments have been in progress at the smelting works of the company at Bingham Junction since the resumption of operations in the lead department of this smelter under permission from the Court in June last. The significance of the achievement may be realized from the fact that the fume from the roasting furnaces, from the converter-roasters, and from the blast-furnaces, after being treated by the new process, contains less than 0.75% by volume of sulphurous gases, that being the maximum permitted by the Court's decree. The system has been evolved by the technical staff of the smelter, working under the leadership of the general manager, Geo. W. Heinz. Until all the patents, already applied for, have been allowed by the Patent Office, the company withholds some of the details, but in principle the method consists in the neutralization of the sulphurous gases with zinc oxide, forming zinc sulphate, which will be retained by the woolen bags in the bag-house. The reaction takes place in the flues, while the fume is passing to the bag-house, at a temperature but little higher than 100° C. The gases having a temperature of about 300° C. are cooled in transit by passing through three series of steel tubes from one brick chamber to another, 10 tubes, each 2 ft. diam. and 20 ft. long, leading from one chamber to the next. Finally the gases are conducted through a steel tube 6 ft. diam. and 30 ft. long. The cooling is effected by radiation of heat through the steel sheet, aided by the evaporation of water trickling upon the first two series of tubes. The gases are forced into the bag-house under induced draft by means of a 100-hp. electrically driven fan. The zinc oxide is produced from crude zinc, sulphide, concentrate, and other material, the composition of which the company does not at present divulge. This is mixed with 50% by weight of crushed coke. The mixture is dampened, and is then fed upon the grates of a battery of small furnaces, constructed like a fire-box about 6 ft. long by 3 ft. wide. Five fire-boxes, or 'zinc-furnaces,' as they are called, with party walls, constitute the plant. The mixture as fed upon the grates is maintained at a thickness of nearly 12 in. Each furnace will treat 5 tons of charge per diem. In the event that material is lacking for these furnaces, commercial zinc oxide, mixed with other ingredients of unstated composition, is fed to the flue-gases at the fan, by an automatic feeder. The bag-house contains 2300 bags, 18 in. diam. by 33 ft. long, which are shaken twice in each 24 hours, the dust falling into a 'cellar', where it is burned before being drawn from the hopper-bottoms into cars. Five tons of dust are produced per day. An addition to the bag-house, sufficient for 1260 bags, is now being built. Cotton bags are employed for the blast-furnace gases, but woolen bags are necessary for the gases from the roasting plant. The roasters are of the old fashioned reverberatory type, operated by hand. There are six of these, each 70 ft. long, only two being fired at present.

In addition to the hand-roasters, the company has developed a 'converter-roaster' within the last four months, which has given such favorable results that a battery of 26 has been installed, and is in operation. This, in effect, is a sintering furnace, adapted to raw ores. Each 'converter' consists of a brick-lined square shell, 6 by 6 ft. in horizontal section, and 3 ft. deep, with a hood 3 ft. high. The bottom consists of closely set grate-bars, through which a blast under 9-oz. pressure is delivered to the charge. To start the charge burning a 'primer', consisting of a mixture of coal and raw concentrate from an iron pyrite ore, previously ignited in a separate furnace constructed similarly to the 'converters', is spread to a thickness of two inches upon the grate; the ore mixture is then spread upon this, 2 or 3 in. at a time. Each layer is allowed to ignite before the next layer is added. The full charge is 8 tons, and the time required for sintering is from 10 to 12 hours. It sinters to a solid cake, which is forced out upon a steel 'boat' by means of a ram, in the same manner as coke is discharged from a by-product oven. A traveling crane then lifts the cake, trips it, and allows it to drop upon a steel floor. If this does not succeed in breaking it sufficiently, a large pear-shaped cast-iron weight is lifted and dropped upon it. The fragments are then further broken by a Blake crusher, and the crushed product is conveyed automatically to steel cars, which deliver it to steel bins in the furnace-house, where it is mixed with the charge for the blast-furnaces.

As before stated, the function of these 'converter-roasters' is to sinter the ore, rather than to desulphurize. The elimination of sulphur from any charge in a sintering furnace is necessarily imperfect, although an important loss of sulphur occurs. The charge for the 'converter-roasters' is made up so as to contain 33% SiO_2, with a sufficient quantity of iron to insure ready fusion. No lime is added, but the charge here used contains lime to the extent of about 5%. The lead in the charge varies from 20 to 25%. The manager claims that this new sintering system is superior in point of efficiency and economy to any pot-roasting or sintering process hitherto developed. The company is also installing an arsenic plant, consisting of a Brunton furnace with a series of brick condensing-chambers for the crude arsenic, and a reverberatory refining-furnace, with its corresponding brick condensing-chambers, for the white arsenic. It is expected to produce a commercial grade of arsenic that will compete with the imported brands.

Utah.

500 ft. under the old workings. This completed, the company will again be in condition to enter vigorously upon a money-making career. Dividends were suspended shortly after the caving, of the Ontario adit over three years ago. Production has been carried on from the upper portions of the mine in a small way. The Daly Judge is producing enough to more than pay operating expenses, including an active development campaign, but the Silver King Coalition Mines Co. is the only dividend payer in the camp at present. Under the control of Jesse Knight and associates, the Uintah Treasure Hill mine is giving a good account of itself, and promises to develop into one of the leading shippers of the Park City district.

LONDON.

Chemical Manufactures. — Electrolytic Alkali Co. and its Products.— Mineral Production of Britain.—San Miguel Copper Mines.— Oil Process Litigation.

From time to time I have referred in this column to the various firms of chemical manufacturers in England and have given particulars relating to the United Alkali Co., Brunner Mond & Co., and the Castner-Kellner Alkali Co. This week I am able to give some information about the Electrolytic Alkali Co., which works the Hargreaves-Bird patents at Middlewich, Cheshire. This Company has had a somewhat checkered career so far, and it has not yet won the financial success that it deserves. Your readers are probably not familiar with the electrolytic process used by this Company for the production of chlorine and soda direct from the brine from the wells. Briefly, the anodes are gas carbon and the cathodes consist of copper gauze against the inner side of which is a diaphragm. The virtue of the process depends chiefly on the composition of this diaphragm; and naturally its exact nature and the method of making it are not disclosed. It consists of a mixture of mineral substances and is not porous under ordinary conditions. It is a hard smooth plate and presumably acts by osmosis. The cathode chamber outside the copper gauze contains an atmosphere of carbonic acid and steam, and the resulting liquor consists of a solution of carbonate of soda. The soda crystals and bleaching powder produced are of the highest quality and the bleach has the advantage of not being hygroscopic, a fault possessed by the product obtained in the Leblanc process, where there is always a certain amount of hydrochloric acid present in the chlorine to form calcium chloride with the lime. Owing to the great competition in the chemical trade it is impossible to obtain any better price than the average for these superior products. In many cases soda and bleach are considered by the big chemical manufacturers as mere by-products to be sold for what they will bring, relying on their other special manufactures for their profits. Bleaching powder, particularly, seems to be overproduced and the supply is greater than the demand. The Electrolytic Alkali Co. suffers for this reason. It does not manufacture anything but what may be called staple products. The only variation is that in some cases bicarbonate and hydrate are made instead of soda crystals. Consequently it is at the mercy of such great organizations as the United Alkali and Brunner Mond, not to mention the German firms whose products enter England duty-free. In the early days of the Company everything went wrong, because the directors, managers, and patentees knew nothing about costs. It is only during the last two years since Mr. Irwin took up the management that business-like methods of chemical engineering were introduced. At the present time the most modern methods are being used for the generation of the electric current, and the Company also has the advantage of owning the brine-wells in the land on which the works are situated.

A few weeks ago I gave some information in this column with regard to the number of people employed in mining in Great Britain. This week the statistics of production during 1907 have been published. As might be expected, coal formed by far the most important item, for the value at the pit's mouth was £120,527,378, out of a total of £135,279,088, the value of the total mineral production. The output of coal was the largest hitherto recorded, being 16,763,334 tons greater than in 1906. The total export of fuel was 85,188,276 tons, which consisted of 2,968,501 tons of coke and patent fuel, 18,618,828 tons supplied for the use of steamers leaving British ports, and 63,600,947 tons of coal sold to foreign buyers. The amount of coal remaining for home consumption was 182,642,686 tons, of which 21,119,547 tons were used in iron smelting. Of the metallic minerals raised during 1907, iron ore was by far the most important, the output being 15,731,604 tons valued at £4,433,418. This ore yielded 5,126,949 tons of iron, which is over one-half of the total quantity of pig iron made in this country. The output of tin ore was 7080 tons of concentrate, containing 4407 tons of metal. The output of dressed zinc ore was 20,082 tons containing 7600 tons of metal. Dressed lead ore to the amount of 32,533 tons containing 24,460 tons of metal, and copper ore amounting to 6525 tons containing 666 tons of metal were produced. With the exception of iron and lead ores the production showed a slight decrease. The production of bauxite was 7537 tons, but no information is given relating to the amount of aluminum extracted. The amount of gold produced was 1911 oz. from 12,978 tons of ore. It will be seen therefore that the metals other than iron and tin play a small part in the mineral wealth of the British Isles.

Reference was made a few months ago to the drastic alterations in the direction and management of the San Miguel copper mines in the south of Spain. The new controlers found that the finance was in a state of chaos and the method of mine management all wrong. After remodeling the accounts and restoring order generally it has been found necessary to raise additional capital in order to make the company solvent. The present debts of the company amount to £45,000, a large part of which is owing to the bank. The directors now propose to increase the capital from £150,000 to £200,000 and to issue the new shares together with 9993 of the 150,000 shares not already taken up. In this way about £60,000 will be provided. I have the pleasure of recording that all these shares have been placed, a sufficiently remarkable event in these days of continued depression.

In your issue of August 22, I gave some information about the litigation between the rival flotation processes, that is, between the Elmores and the Sulman-Picard-Ballot group. I mentioned that there were three suits pending. Two are actions over patents, the two parties being alternately plaintiff and defendant. The third is an action relating to an agreement between Messrs. Ballot, Webster, and Hay, made in 1898, when Mr. Ballot and his friends were thinking of taking up the Australian patents of the old Elmore oil flotation process. As is usual when patentees let other people into their works, there was in this case an agreement made whereby all improvements discovered by Mr. Ballot and his chemists should belong to the Elmores. Subsequently Mr. Ballot decided not to acquire the patents, but instead acquired the Cattermole and other patents and introduced improvements which were patented by him in conjunction with Sulman & Picard, the chemists who had conducted the investigations at the Elmore works. The Elmores claimed that these improvements were the result of the experience gained in their works and consequently brought this action. After going forward this week for some days, the judge, Justice Parker, drew attention to a point of law, which, curiously enough, had not occurred to the eminent array of counsel engaged by the two sides. He threw out the hint that Mr. Ballot had not acquired the Cattermole and subsequent patents for himself and his co-partners, Webster & Hay, but as trustee for the company known as the Minerals Separation Syndicate. It seems remarkable that people can assume so many different capacities, but the lawyers present could not contest the correctness of the Judge's view. The case therefore came to a sudden termination,

each side having to pay its own costs. This result does not affect in the least the question of the validity of the various patents, the actions in connection with which will go forward in due course.

MEXICO.

Increased Production of Ore in Chihuahua.—New Productive Mines.—Oil Competition.—Rio Plata.

In September I made note in these letters of the material improvement in mining conditions about Chihuahua, and of the increased shipments of ore from that point during August over and above June and July of this year. September showed no marked difference in production from that of August, but the October output forged ahead with some 3000 tons more than that of August, or a total of 18,750 metric tons. The greater portion of this increase in production came from Santa Eulalia, some of the producers in that camp having added to their August tonnage by over 50%, and the grade, too, has had to be brought up to meet the lower metal markets. The outlying districts have also added their increased quota to swell the whole, due largely to improved transportation with the passing of the rainy season, but also to the good results of intelligent development work throughout the region about Chihuahua. It is only the immense orebodies at Santa Eulalia and the remarkable richness of the ore from the other districts that has made this possible during the continually declining metal markets. One of the most important of these rich new producers is the San Francisco, of J. S. Qualey, at Yoquivo, a short distance west of Pinos Altos; from this mine a high-grade gold and silver ore is being shipped to the American Smelting & Refining Co., netting $600 per ton for the first-class and $300 for the second-class, while the milling ore running about $60 is being stored. Mr. Qualey has an option on this property from the owner, Gov. Enrique C. Creel. At Pinos Altos nothing is being done by the Company, but the lessee of the upper levels, W. P. Dunham, is getting in shape to work them in an energetic and systematic manner, and before the end of the year will be obtaining results. In Uruachic T. A. Ripperdan is sinking on a rich ore running well in gold, silver, lead, and copper in the San Timoteo, and is now obtaining bids for a mill for the proper treatment of the ore; and the Watterson Gold Mining Co. near-by is rapidly completing its new mill. At Sahuayacan the Sahuayacan Mining Co., which has been re-organized as the Pennsylvania-Mexico Mining Co., with $1,000,000 gold capital, still under the management of George E. Howard, is preparing to resume operations, and Pittsburg people have taken an option at $200,000 on the adjoining Santa Teresa mine and mill, where development work will be resumed, also under the charge of Mr. Howard. East of Chihuahua about 40 miles, in the Chorreros mountains, the Chihuahua Copper Co. is shipping from two to three cars per week of high-grade concentrate to the Aguascalientes plant of the American Smelting & Refining Co.; The Mexican Midland Co., of D. M. Evans, is opening up a splendid looking body of lead carbonate; work has been resumed on the Mano Negra of M. F. Guerrero, near San Sostenes; and New York people have had their engineer making an examination of the Las Vigas copper property of G. E. Voorhees, Jr., also near San Sostenes, which has been idle since the drop in copper last year. In the Santa Barbara district, near Parral, the experiments of the Minerals Separation Co., using the Sutton-Steele dry table, seem to have proved a complete failure in the treatment of the complex sulphide ores of the San Francisco del Oro mine, of which there are immense bodies, and the Company now contemplates re-organization with £375,000 capital to raise funds for further investigations, while continuing shipments of the clean lead sulphide ore.

The threatened oil war which was mentioned in these letters several months ago seems to be under way in Mexico City, the Waters-Pierce Oil Co. meeting every cut made by the new company of A. Pearson & Son. Clay Arthur Pierce, president of Waters-Pierce, is at present in Mexico looking after the Company's affairs. The gusher of A. Pearson & Son at Dos Bocas, in the State of Vera Cruz, which exploded and caught fire on July 4, and spouted fire for three months, continues to flow at the rate of about 15,000 bbl. of oil per day together with great quantities of salt water, the oil being stored in immense surface reservoirs while the water is drained into the Gulf of Mexico. The rapidly increasing production of oil in Mexico is leading to its extended use as fuel on the railroads, and a number of industrial enterprises, among which is the American Smelting & Refining Co., are experimenting with it for boiler purposes.

The Rio Plata Mining Co. has been operating about a year and its property has yielded a net return of $20,000 per month for the past ten months. The mine is situated in the Sierra Madre, in southwestern Chihuahua, on the Rio Setentrion, which flows to the Pacific. It is reached by an 85-mile trail from Sanchez station on the Kansas City, Mexico & Orient railway. The mine is developed by 2500 ft. of work on a vein that has an average width of 4½ ft., having a dip of 73° and cutting through a mountain spur of diorite. There are six adit-levels on the vein, entering from the mountain side that overlooks the river. There is a vertical distance of 545 ft. between the highest and lowest of these levels. The ore consists of quartz, carrying silver as sulphide, bromide, and metallic, associated with iron sulphide. Some well defined slabs of silver sulphide and native silver have been found next to one of the vein-walls. A shipment of 15 tons of ore was made that yielded 5350 oz. silver per ton. This, of course, was selected and sorted from the highest grade in the mine. A 25-stamp mill, operated by water-power, is situated on the river and a 1400-ft. tramway conveys the ore from the mine to the mill. The latter is equipped with stamps, Card tables, Wheeler pans, Pachuca tanks, and Moore filters. An electric plant, with a generator run by water-power, is under construction. The Rio Plata is a New York company, of which Henry W. Miller is president, with D. W. Shanks, of Chihuahua, as general manager. Mr. Shanks has directed operations and constructions from the start and has had some strenuous experience in transporting heavy equipment by pack animals a long distance and getting it installed in double-quick time.

Rio Plata Mill, Chihuahua.

John Breckinridge, manager for the Illinois-Jalisco Mining Co., was shot by Carlos Madrid at Ajutla on October 23. He was wounded in the abdomen, and died on October 30. The Certuchena mines, in Tepic, have been purchased for ₱50,000 by a syndicate headed by M. P. Wright, who is said to represent Epes Randolph, of the Southern Pacific Railway. The Certuchena mines have been owned for many years by Lonergan and Stanhope, two Englishmen. J. P. Casey is to be manager for the new company. The Magistral and Las Moras copper mines, in the Ameca district of Jalisco, have been bonded to James P. Harvey, Patsy Clark,

and others, for $100,000. The company owning these properties was organized by L. H. Taylor, Jr., of Philadelphia. A good deal of exploratory work has been done this year, under the direction of Mr. Harvey.

The San Toy Mining Co. is shipping 100 to 120 tons of ore daily from its Galdeana and Juarez mines, in Santa Eulalia district, the greater part of it coming from the latter. The ore runs 5% lead, 20 to 40 oz. silver, and 18 to 22% iron. The lead occurs as a carbonate and the silver as a chloride. The orebody is continuous for over a mile, striking through the limestone of the district, and is contiguous to a well defined fissure which for the most part contains barren material. While the ore-zone has a definite strike along this fissure, it does not occur as a vein, but as a deposit of irregular width in the lime, and has a dip of 15°, which corresponds to that of the bedding planes. Its width ranges from 10 to 200 ft., the gangue being an altered lime. The limestone of the district, in which the orebodies occur, is overlaid by a rhyolite cap, which on this group is 350 to 400 ft. thick. The Galdeana shaft is 1170 ft. deep, cutting one ore deposit at 400 ft., and another at 1100 ft. The Juarez shaft is down 564 ft., with its main level at 464 ft. The working force consists of 200 men at the Juarez and 80 at the Galdeana. Development to the extent of 1200 ft. per month is being done. A 3400-ft. aerial tramway, with wood towers, carries the Juarez ore from that mine to the Galdeana terminal of the main four-mile tramway, having steel towers. The latter conveys the ore to the bins at the San Toy's railroad that connects with the Mexican Central. On the operating force are W. N. Fink, general superintendent; C. P. Halter, superintendent of the Juarez mine; H. J. Lynch, foreman of the Galdeana. Donald B. Gillies, president of the company, is inspecting the property at this writing.

BUTTE, MONTANA.

Butte & Superior Lawsuit.—Raven Affairs.—Development of the Big Mines.—Productive Area.

The Butte & Superior Co. has won its suit against John McAlpine, a wealthy lumberman of Duluth, whom the company was compelled to sue to get payment of $2000 due on a note given for a stock subscription. McAlpine, who claims that he was induced to subscribe through misrepresentation as to the value of the company's property in the Butte district, declares that he will fight the case to a finish, and will therefore move for a new trial and then appeal. The trial has been bitterly fought, for to lose the suit meant that every subscriber would have a right to follow the McAlpine lead and sue to recover money paid to the company. According to reports, there was some astonishing testimony given on both sides of the case. The Butte & Superior ground lies outside the copper-producing portion of the district, but its prospects are good. There has been a great deal of published misrepresentation as to the value of the property, but the chief grievance of McAlpine probably lies in the fact that he paid $4 per share for his stock and it is now selling below $1, which is all it is worth on the present showing of the mine.

A report of the Raven Mining Co. contains information that must have been known to most of the stockholders, namely, that the company has not been successful in developing a mine. The report covers a period from June 1, 1907, to September 11, 1908. Previous to the first date the company had been idle for a year and a half, following the sensational rise in the price of Raven stock to $8, the closing of the property through the action of the Amalgamated, and the drop of the stock to 50c. per share. In order to reopen the Raven mine a lot of re-timbering in the shaft had to be done, and a number of caves had to be taken up. The shaft has since been sunk from 700 to 1200 ft. A larger hoisting engine has been installed and larger surface buildings erected. About 5000 ft. of openings have been made, in drifts, cross-cuts, shaft, and winzes. The work exhausted the funds of the company, and it is reported that recently one of the large stockholders in the East took 30,000 shares more of treasury stock at $1 per share, the par value, without commission, thus providing temporary relief. It is expected that with this sum the shaft can be sunk an additional 300 ft. In the upper levels of the mine lessees have been at work on the silver-gold ores and have paid the company several thousand dollars in royalties. This work has been of particular value, in that it did development at a profit, instead of an expense. According to the report of the general manager, the vein cut on the 900-ft. level is 26 ft. wide and filled with low-grade ore.

The Amalgamated, North Butte, and Coalition mines are being kept several years ahead of mining by development work, and more than a ton of ore is placed in reserve for every ton mined. Every property of the Amalgamated, with the exception of the mines of the Parrot and Trenton companies, has developed wonderfully during the past few years. A great amount of work of an exploratory character is now going on in the Parrot and Trenton mines, with the hope of opening new orebodies. The Trenton, which is working the Gagnon mine, recently finished sinking the shaft several hundred feet deeper, and is now cross-cutting at the 2300-ft. level for the purpose of opening the veins. The Gagnon was a silver producer in years gone-by, but ever since the Amalagamated has controlled it, this mine has been disappointing. The Gagnon vein seems to pinch out as it strikes westward, and the workings of that mine are the farthest west of any producing mine in the Butte district. The farther west the workings have been extended the poorer and smaller the vein has been found. On the east side of the Anaconda hill the veins are broken and faulted, and on the west side the veins seem to pinch out to nothing, so that as far as present developments have disclosed, the big copper deposits are practically confined to 'the hill'. However, the hill mines themselves, instead of showing any evidence of diminishing value, are yearly getting better, and the deeper the veins have been explored the richer they have been found. This is true of the Anaconda, High Ore, Bell, Diamond, Neversweat, Mountain Consolidated, Buffalo, St. Lawrence, J. I. C., and Gallatin mines of the Anaconda Co.; of the Pennsylvania, Mountain View, Leonard, East and West Colusa, and other operated mines of the Boston & Montana, and it is hoped to prove true of the Parrot, in which the Amalgamated Co. is cross-cutting to open the veins at the 1900 and 2000-ft. levels. The vein on the 1900 should be reached in another week or two. John Gillie, the manager, says he has no doubt that ore will be found in the vein on that level; in fact, it has been reported among miners that the vein has already been reached, but the general manager denies it. It is stated that the cost of producing copper in Butte now does not exceed 10c. per lb. in any profitable mine.

Butte stockholders of the Snowstorm Mining Co. have received notice of a dividend of 3c. per share, payable October 20, to stock of record October 10. The last previous dividend was paid a year ago. The Company is capitalized for 1,500,000 shares and has distributed in dividends to date $540,000. The Greenough Bros. are the chief stock holders. They have been operating the property as a sort of family affair. Mining men generally consider the Snowstorm as a big copper property with wonderful possibilities.

The Butte Standard Copper Mining Co. is developing a property north of Butte and is driving an adit with the object of opening a vein at a depth of 200 ft. It expects to reach the vein about the middle of November. It is reported that the New Boston Mining Co. has struck good ore in the property it is developing at Corbin, adjoining the claims of the Boston & Corbin Co. The claim is being developed by adit, which is now 400 ft. long. A strike in the Copper Eagle mine in the north Butte section was made in the shaft at a depth of 350 ft., and it is claimed that 2 ft. of the ore will assay 400 oz. in silver, while a streak assays 1000 ounces.

The only work now in progress in the once active Butte & Bacorn district, north of Butte, is being done by the North Butte Mountain Co., which is engaged in sinking a shaft on the J. I. C. claim.

TORONTO, CANADA.

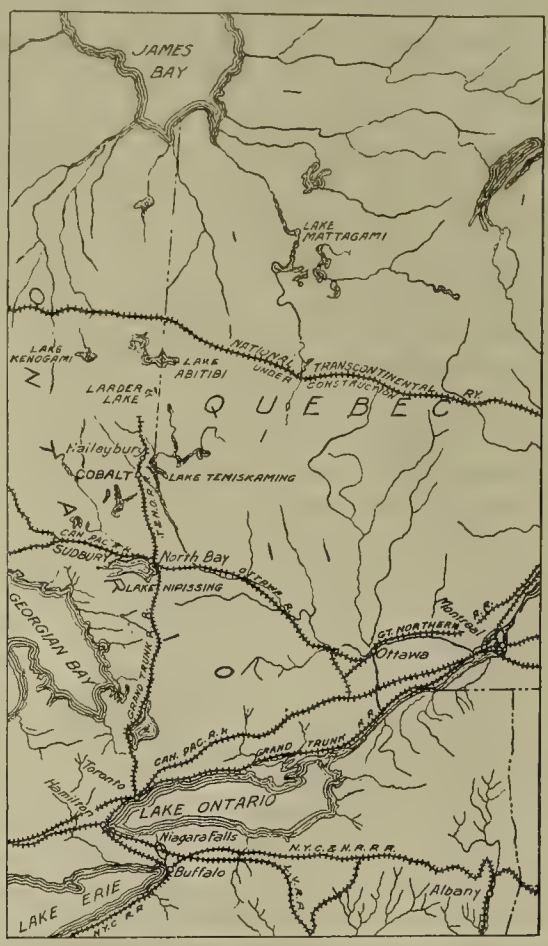
Activity in Cobalt Stocks.—Red Rock.—Temiskaming.—Coniagas.—New Flotation.—Government Wagon-road.—New Discoveries.

The local stock market has lately been characterized by great activity in Cobalt stock, and a steady upward tendency, extending to almost the entire list, stimulated by large buying orders from abroad. A noticeable feature of the present boom is the greater discrimination shown by the purchasing public, as evinced by the demand for dividend-paying stocks or those of actually producing mines, as compared with shares of a merely speculative character. Another feature indicating that the market is getting on a sounder basis is that in the new flotations the capitalizations are generally low. The continued appreciation of the principal issues is apparently justified by the conditions of the mining industry, the increase in the volume of shipments, and the new discoveries, which are almost of daily occurrence.

The Red Rock mine, which has been inactive for some time, has been sold to F. B. Chapin for $26,100. The new owner has put a force of 25 men to work on the property, three-fourths of which has never been stripped. The shaft will be sunk for 100 ft. farther and a boiler and air-compressor installed. The Silver Leaf has cancelled the agreement under which the mine was worked by H. G. Symmes, and has engaged George Leyson, formerly of the Silver Queen, as manager, with Stuart H. Thorne as assistant. Important finds have been made on the Temiskaming, where vein No. 2 has widened to 43 in. of high-grade ore composed of silver sulphides, native silver, and smaltite. In cutting a station in the shaft at the 100-ft. level a new 12-in. vein was struck a few feet from the shaft, carrying over 4000 oz. silver per ton. The Chambers-Ferland recently struck the La Rose vein at a depth of 85 ft., showing ore identical with that of the latter company, namely, cobalt, smaltite, and niccolite with much native silver. At the Cobalt Central a find has been made at a depth of 185 ft. by diamond-drilling the vein, which is 20 in. wide, of smaltite, native and ruby silver, paralleling the main vein. The Coniagas is increasing the capacity of its concentrating plant to 30 stamps, which it is expected will be all in operation by December 1, making the daily capacity of the mill 120 tons. At the first level preparations are being made to stope, so as to keep the mill going. A new shaft is being sunk on the Fourth of July Nipissing vein on the Coniagas. It is down 60 ft. and will be continued to 120 ft. to connect with No. 2 level of the main workings. The Temiskaming & Hudson Bay has picked up the new vein found on the Little Nipissing, which must extend across the Right of Way property, and has also struck a new vein varying from 6 to 18 in. wide and well mineralized. The Gifford Cobalt Mines is a new flotation, capitalized at $150,000, to work a well known property adjoining the Temiskaming. The shares, which were put at 25c. each, were rapidly sold.

The Ontario Government has undertaken the construction of a wagon-road to open up the new mining regions lying to the northwest of Cobalt. It will run from Earlton, a point on the Temiskaming & Northern Ontario railway 25 miles north of Cobalt, westward for 49 miles through Elk City, across the Montreal river, terminating at the northern end of Gowganda lake. A large number of claims have been taken up lately on Gowganda lake, and Miller lake, in the immediate neighborhood, but the inaccessibility of the region has greatly retarded development work. It is hoped that the road will be completed by next spring. The town of Elk Lake, on the Montreal river, about half-way between Earlton and Gowganda lake, has this season developed as a trading centre and source of supplies for mining parties. Prospecting has been going on all the summer and fall, and many sales of properties at good prices have been made. Development work is being actively carried on at the Otisse, Moose Horn, Blackburn, Cartwright, Cragg, and other properties, and many discoveries have been reported. At the Bonsall locations, comprising 320 acres between Miller and Everett lakes, seven veins have been found, the largest showing 7 in. of ore, and 15 bags of high grade ore are ready for shipment. George Glendenning, well known in connection with the University mine, Cobalt, is one of the syndicate that has undertaken the development of the Bonsall properties.

Willet G. Miller, Provincial Geologist of Ontario, has gone to inspect some of the new silver bearing regions surrounding the Cobalt area. A statement published by the Provincial Bureau of Mines gives the value of the output of the metalliferous mines and works of Ontario for the six months ending June 30, at $8,083,264, the details being as follows: Arsenic, 256 tons, value $1573; cobalt, 365 tons, value $39,822; gold, 1524 oz., value $27,672; silver, 7,746,537 oz., value $3,888,991; copper, 3887 tons, value $547,417; nickel, 4779



Map Showing Position of Cobalt and New Districts in Ontario.

tons, value $932,828; iron ore, 84,440 tons, value $214,284; iron pyrites, 8728 tons, value $27,968; pig iron, 184,365 tons, value $2,401,709. The Larder Lake Proprietary Goldfields, Ltd., is being wound up, the court having issued an order to that effect on the application of creditors. It was one of the most prominent of a number of wild-cat concerns with big capitalizations which took advantage of the fact that some real gold existed at Larder Lake to exploit the over-credulous public. It had a $3,000,000 capitalization, collected some $160,000 in real money, worked the property for a few months, and stopped operations a year ago for want of funds. The applicants state that not over $50,000 of the money received was laid out in development. They charge the directors with misappropriation of the funds and ask for an investigation. They will probably get it, but what good it will do anybody is not very clear. There have been 'investigations' in plenty in connection with similar swindles, but there it has ended. The Highland Mary promoters are still at large.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Cross-cutting is the term used in Alaska to describe the drilling of a series of holes across a creek.

Deviation in diamond-drilling has been known to be as much as 2185 ft. in a depth of 4802 feet.

A good 'dope' for protection against mosquito bites is citronella, an oil distilled from lemon peel.

Citizenship of the stockholders of an American corporation need not be proved, and issue cannot be taken on this point.

The capacity of a circular tank in U. S. gallons (231 cu. in.) is $d^2 \times h \times 0.0034$, in which d and h are the diameter and height, respectively, of the tank in inches.

Miners feel the effects of moist heat when the wet-bulb thermometer registers 75° F., and it becomes necessary to strip, so as to expose a greater surface for evaporation.

A contract between mine and smelter for the purchase of ore has been repeatedly held to be non-assignable, as the mine contracts for the skill and integrity of that particular smelter.

The act of naturalization is retroactive, so that if an alien has located a claim and afterward becomes, or declares his intention to become, naturalized, his location is good from its original date.

Alcohol can be used with more or less success in stationary and marine gasoline engines, and these gasoline engines will use from one and one-half to two times as much alcohol as gasoline when operating under the same conditions. The possibilities, however, of altering the ordinary gasoline engines as required to obtain the best economy with alcohol are limited; for the amount that the compression can be raised without entirely re-designing the cylinder-head and valve arrangement is ordinarily not sufficient, nor are gasoline engines usually built heavy enough to stand the maximum explosive pressures with alcohol, which often reach 600 and 700 lb. per sq. in. With the increase in weight for the same sized engine designed to use alcohol instead of gasoline, comes an increase in maximum horse-power of a little over 35%, so that its weight per horse-power need not be greater than that of the gasoline engine, and probably will be less.

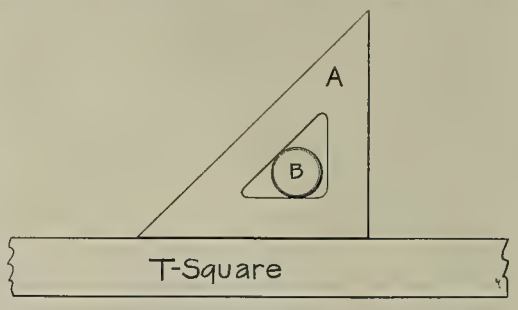
Pure carbide will yield from 5.5 to 5.8 cu. ft. of acetylene per pound, but chemical purity is not practically possible from an economic standpoint. Between 4.25 and 4.75 cu. ft. is the average efficient yield when used in a good generator. The relative quantities, by weight, of water and carbide necessary to form acetylene and dry slaked lime are 36 parts of water and 64 parts of carbide, which yield 26 parts of acetylene and 74 parts of slaked lime. Water will, therefore, theoretically decompose nearly twice its weight of carbide, but in practice, in a good generator, about 17 times this quantity is used. The reason for this is that the decomposition of carbide and water into acetylene and lime liberates heat. The quantity liberated from good carbide is 730.73 B.T.U. per pound of carbide. One pound of carbide will raise the temperature of 8⅓ lb. (one gallon) of water about 87° F. Cool generation is essential, as at temperatures in the neighborhood of 700° C. acetylene becomes polymerized, forming benzine and other hydrocarbons, which condense in the pipes and cause great difficulty.

Centre of pressure of any plane surface immersed in a liquid is given by the following rule: Find the moment of inertia of the surface and its statical moment, both with reference to an axis situated at the intersection of the plane of the surface with the water-level. Divide the former by the latter, and the quotient is the perpendicular distance from that axis to the centre of pressure. The statical moment of a surface is its area multiplied by the distance of its centre of gravity from the given axis. The moments of inertia of plane surfaces, with reference to an axis through the centre of gravity, are deduced in works on theoretical mechanics. The following are a few values, the axis being parallel to the base of the rectangle or triangle:

For a rectangle of base b and depth d, $I = {}^1/_{12}bd^3$.
For a triangle of base b and altitude d, $I = {}^1/_{36}bd^3$.
For a circle with diameter d, $I = {}^1/_{64}\ 3.1416d^4$.

To find from these the moment of inertia with reference to a parallel axis, the formula $I^1 = I + AK^2$ may be used, in which A is the area of the surface, K the distance between the two axes, and I^1 the moment of inertia required.

Section-lining or cross-hatching may be accurately spaced by the simple scheme illustrated herewith. A is an ordinary draftsman's triangle, and B is some convenient coin a trifle smaller than the triangular hole in the centre of the triangle. The spacing is obtained by alternately moving the coin while the triangle remains stationary, and moving the triangle



while the coin remains stationary. If no coin of suitable size can be obtained, it is but the work of a minute to cut a circular piece of cardboard, which will serve. A number of pieces may be prepared, thus giving different widths of spacing. With a little practice the process becomes automatic, and may be carried along much faster than when the spacing is done by the eye.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Electric Counter-Balanced Hoist.

The Editor:

Sir—In regard to recent discussions on counter-balancing of hoists, I enclose a photograph of a hoist installed at the Tepeyac mine. This was built by the Denver Engineering Works, and is their single-drum 50-hp. Cripple Creek type, but was equipped with a 35-hp. motor. The mine developed so rapidly that, under pressure of additional tonnage, the 35-hp. motor (a Westinghouse of the old type) was run for six months at 65 hp., the hoist being in continual service 24 hr. per day, and the motor stood the test.

To relieve the motor and get still greater tonnage,

the drum was divided in two by a locally made cast-iron flange (shown in the centre), made in two pieces, bolted together loose on the drum, and secured in place end-wise by pine lagging-strips bolted to the drum on both sides, and filling the space between the end flanges and the central dividing flange. As these lagging strips were 6 in. thick, the diameter of the drum was increased from 36 to 48 in., and by change of gear-ratio from the motor a further increase of rope-speed was made, amounting, together with the increase of the diameter of the drum, to a 50% increase of hoisting speed. A counter-balance of the same type as is used in passenger elevators was then hung in the shaft on wire guides, simply secured at the top and bottom of the shaft, and a ⅝-in. rope led over a pulley in the head-frame to one division of the drum, the hoisting rope occupying the other division. The counter-balance weight was calculated to equal the full weight of the cage, car, and one-half the ore to be hoisted, so that the motor works equally both raising and lowering.

The sum total was that the ore per trip was increased from 1600 to 2200 lb.; the hoisting-speed increased from 400 to 600 ft. per minute; and the motor now uses 23 instead of 65 hp. The hoist has been in use in this shape for nearly a year under the above conditions, and has proved most satisfactory. It is hoisting 24 hr. per day from a depth of 650 feet.

C. W. VAN LAW.

Guanajuato, Mexico, October 18.

Sampling of Ore.

The Editor:

Sir—In many of the articles on ore sampling which have recently appeared in the different mining journals there appears to be a manifest desire to discredit the usual methods of ore valuation, but most of the writers evade the real question at issue, and evince a distrust of all methods of sampling, instead of directly specifying those that are known to give erroneous results. The action of crushing machines in retarding the speed of the coarser particles is as well known as the increased rate of travel of the coarser particles in spouts and on the sides of ore piles. In a properly designed sampling machine which takes exactly the same proportion of coarse ore that it does of the fine, this difference in the rate of travel could have absolutely no effect on the sample. In fact, if a given lot of ore were screened and the coarser portion sampled today and the fine tomorrow, and the resultant samples mixed, the result would be exactly the same as if the coarse and fine were sampled together, provided the method of sampling employed took exactly the same proportion of coarse ore that it did of fine. The shaking-tray feeders which one writer mentions are used in all modern crushing and sampling mills for the purpose of delivering a continuous evenly distributed stream of ore to rolls and other crushing machinery in order to minimize wear and prolong the life of the wearing surfaces, and they do not in any way affect the accuracy of the sample; indeed, there is a distinct gain in the use of them, as spasmodically fed crushing machines cannot deliver a product as uniform in size and quantity as similar machines supplied with a steady feed.

A correspondent in your issue of October 17, 1908, mentions the fact that in several instances that have come under his notice, the first sampling of the ore gave lower results than the second. This could only occur in plants where, by accident or design, the methods employed, whether hand or mechanical, took into the sample a larger porportion of coarse ore than of fine, and on the re-sample of the crushed ore, where the ratio of coarse to fine was materially diminished, this sorting action would be less; consequently, the second sample would be considerably higher than the first, provided the fine ore, as is usually the case, assayed higher than the coarse. No sampling machine or method that depends on mixing the ore can ever be accurate, as no amount of turning, whether with a shovel or by mechanical means, can effect a perfect mixture of coarse and fine material. During the process of crushing ore, and in its passage through the spouting, piling up on the floor, or even in filling bins, a continuous sizing action is going on.

To sample ore accurately, some 'time sampling' device is necessary, or, in other words, some arrangement that will take a sample which shall be entirely independent of the physical condition of the ore, and will give exactly the same percentage of fine and coarse, no matter what the size of the particles may be or the amount of moisture contained therein. A number of machines on the market are capable of

doing this, but in the actual operation of these devices many conditions obtain which impair the accuracy of their results, the most common of these being leaks in the spouting conveying the ore from one machine to another. Through these small openings quite an amount of fine ore often filters, and falls on the floor below or into the elevator-pits. The portion of the ore thus lost is, of course, not represented in the sample, and if the fine is of a higher grade than the coarse, it is easy to see that the loss of the proper ratio of the fine in the sample will seriously affect the result and cause loss to the shipper. Many sampling machines in common use have been planned by persons not fully conversant with all of the conditions necessary for accurate work, and they are therefore faulty in design, and by means of their construction they cannot take an accurate sample of anything except homogeneous ore. Other machines, designed with the greatest care, and capable when in perfect running order of taking absolutely accurate samples, are carelessly erected or hammered and abused by the workmen to such an extent that accurate work is impossible. Where the cutting edges of the sample-spout are long and radial to the shaft on which they revolve, it is not uncommon to find these edges hammered and battered and their alignment so distorted by the workmen as to preclude the possibility of accurate work unless the ore is fed in a homogeneous stream. This is, of course, impossible, as in any feed-spout the coarse rapidly moving particles go to the centre in a vertical spout, or to the top in an inclined one, while the finer slower moving particles hug the sides or bottom. The only remedy for this is to use 'time sampling' machines with cutting edges parallel and so short that distortion is out of the question. When this is done, accurate samples can be obtained, no matter how dissimilar the ore may happen to be in coarseness or assay-value. In every-day practice in many sampling mills, ore in lots of less than carload size are bought and stored for mixing. After sampling they are stored in bins until settled for, and when a sufficient number of these small lots have accumulated to form an even number of carloads, they are run through the sampling mill in succession, without mixing. From the settlement sheets on the original lots, the metallic contents and the assay-values per ton that should be in the mixture are calculated, and it is invariably found that the mechanical and mathematical results agree closer than two control assayers can check on an average lot of ore.

At the first sampling these lots are coarse and wet, at the second sampling they are all fine and have, of course, dried so that they contain much less moisture, thus affording the severest possible test of accuracy. In fact, the extremely accurate checks always obtained under these conditions prove conclusively that modern sampling methods are correct, and that the valuation systems in vogue are absolutely independent of the physical condition of the ore or the whims of the workmen.

D. W. Brunton.

Denver, October 23.

Tailing-Wheels or Pumps?

The Editor:

Sir—On reading over my article which appears in your issue of October 31, I notice the following error in transcribing my notes: Commenting on the old tailing-wheel formerly in operation at the new mill of the Smuggler-Union Mining Co., at Telluride, Colorado, I state that it is doubtful if this wheel required over 15 hp. to operate. This should have read 5 horse-power.

Edgar A. Collins.

Tonopah, Nevada, November 3.

Shallow Deposits.

The Editor:

Sir—About half a mile south of the town of Del Norte, in southern Colorado, is a small knoll formed by a tilted flow of rhyolite. It is partly covered by a very recent conformable basalt flow 50 ft. thick, and from the appearance of the rhyolite it would seem to be of the same age as the basalt, probably Pleistocene. On the road to the summit of the hill there is a small vein of chalcedony or jasper 5 to 6 in. wide. It assayed $1.20 in gold and no silver. Would this not seem to show, contrary to most text-books, that mineral deposits can sometimes be formed at very moderate depths?

I should like to know if others have ever observed the same phenomena.

Thayer Lindsley.

Telluride, Colorado, October 27.

Sampling Ore.

The Editor:

Sir—In one of the recent numbers of your journal, I noticed the following paragraph: "The alternate shovel method of sampling ore is cheaper and quicker than the coning and quartering method, and is apt to give a closer approximation to absolute accuracy unless the coning is very carefully done." I should be glad to know whether this statement is based upon experiment, and if so, where the records of the experiments are obtainable.

I did some work on this point myself in the year 1905, and the results I obtained were published in one of the Bulletins of the Institution of Mining and Metallurgy. My conclusions were the exact opposite to those given above, as regards the accuracy of the methods, which is after all the important point in sampling. In point of time, if the mixing of the samples between each cut is done by rolling on canvas, there is very little to choose between the methods. It seems to me that the alternate shovel method of sampling is open to two main objections. First, it allows too much chance of selection. It is quite easy for the man who is doing the shoveling to arrange that any specially rich-looking stone should go into the kept portion, rather than the reject, and this would be a natural tendency, quite apart from any outside interference. Secondly, it is not easy to get a fair proportion of the fine in each half. In throwing a sample into a heap, as is done in mixing it, the fine gravitates to the centre of the pile, the result being that in shoveling the sample, the last shovelful

is almost entirely fine. This is sometimes got over by quartering the last shovelful or so which is left on the plate after the bulk of the sample has been dealt with, and this undoubtedly is an improvement. It is probable, however, that the penultimate shovelful will have more than its own proportion of fine, and according to whether it goes into the sample or the reject will alter the assay value 2 or 3 tenths.

A. T. FRENCH.

London, October 21.

Eucalyptus for Mine Timbers.

The Editor:

Sir—I was interested in reading A. H. Martin's article in your issue of October 17 on 'Eucalyptus for Mine Timbers.' It is well that this question of mine timber should be thoroughly discussed, for it is of vital importance to the mining industry all over the world. People do not realize what a part American forests have played in the development of mines in other parts of the world. The export of timber to South Africa, for instance, in the past 20 years has been enormous.

When the Rand was first discovered there was scarcely a tree to be seen. Rows of eucalyptus trees were planted, and large tracts of land were filled with them. After 10 or 15 years these shrubs have become forests. In South Africa the *eucalyptus globulus* or 'blue gum' has proved a fast grower. People now regret the planting of all these eucalyptus trees. It is true that they are fast growers, but the wood is inferior. Today the forestry department of the Transvaal is trying to induce people to plant other trees, and give up the wholesale planting of 'blue gums.' This tree robs the soil to a great extent. It is difficult to get flowers or vegetables to flourish near it. The wood is of poor quality. A large number of 'blue gum' props are used today in the stopes of mines on the Rand, but this timber would not be strong enough in heavy ground. Where the weight is not great, where, for instance, a small slab of hanging wall is to be held up in a narrow stope, 'blue gum' props answer very well.

I quite agree with Mr. Martin that mining companies should pay more attention to re-forestation, but I do not believe the eucalyptus should be introduced on a large scale in America, when there are such splendid indigenous trees to plant. In places where only the eucalyptus will flourish, as in waste lands with a limited amount of moisture, the 'blue gum' plantations could be introduced and made a success, where other trees might perish. In some malarial districts of America, the eucalyptus forest should prove successful in driving out malaria, as it has in other parts of the world. These trees could be introduced into those places with advantage, not only for the sake of re-forestation, but from the point of view of health as well. In the best lands, however, where indigenous trees will flourish, I believe the *eucalyptus globulus* should not be planted. Other varieties might give more satisfactory timber.

T. LANE CARTER.

Wardner, Idaho, October 26.

IRON ORE DEPOSITS IN SHASTA COUNTY, CALIFORNIA.

In view of the successful tests for the production of pig-iron on a commercial scale, recently carried out at Heroult, the extent and value of the magnetite deposits of Shasta county are naturally attracting attention. The experiments have demonstrated that pig-iron can be successfully produced by electric smelting at comparatively low costs, while the objections to the old Heroult plant have been practically eliminated by the improved Lyon furnace. The production of pig-iron in Shasta county on a large scale seems now to be assured, and the interested parties are turning their attention to the development of the magnetite deposits.

The principal deposits of iron in Shasta county lie along the McCloud river, the ore occurring between the Carboniferous limestone and the contiguous rocks. Where the Pit river has cut across the formation in its westerly course the indications are favorable from the higher points of the canyon to the river bed, 1500 ft. below. Practically all the mine development in the district is concentrated at this point. The limestone belt continues from the head of Stillwater creek about six miles south of the Pit river and several miles in a northerly direction.

A few miles above the confluence of the Pit and McCloud rivers, Potter creek cuts across the country from the east and exposes a large lode of magnetite, which at some points runs from 400 to 800 ft. above the level of the stream. The deposits occur between limestone and diorite, and apparently have a northeasterly and southwesterly strike. Sufficient work has not been carried on here to determine the magnitude or extent of the deposits, but the indications are excellent.

Active exploration and development is centred on the Pit mine, lying in Section 26 on the McCloud river, and owned and operated by the Shasta Iron Co. This property has been held for its value as an iron producer since 1884, and for a number of years much of the production was shipped to the Bully Hill smelter at DeLamar for fluxing purposes. The quarry from which this ore was taken is approximately 200 ft. below the apex of the mountain. At a point 100 ft. below the floor of the quarry an adit has been driven for about 150 ft. The lode is apparently 150 ft. thick at the quarry, with a fair percentage of iron. The iron content shown in the adit is estimated to be from 50 to 70%. At the summit of the mountain the croppings appear to be about 250 ft. wide, and have been traced for 1500 ft. on the estate of the Shasta Iron Co. Indications are good for opening up a vast tonnage of commercial ore. It is estimated that the average value of the ore will run about 65% iron, with little sulphur or phosphorus.

The Noble Electric Smelting Co., controlling the Heroult smelter, has entered into an agreement with the Shasta Iron Co. to treat the ore on a large scale as soon as the plant has been placed in commission, and has also secured options on many properties along the McCloud river.

THE SAN JUAN REGION, COLORADO.—II.

Written for the MINING AND SCIENTIFIC PRESS
By THOMAS T. READ.

From Lake City the trail leads up Henson creek, over the divide just north of Engineer mountain, and down Bear creek to Ouray, a distance of about 20 miles. Here, again, to accomplish the journey by rail requires a whole day, with two changes, passing through Sapinero, Montrose, and Ridgway. The entrance to Ouray is through a narrow gorge, where river, railroad, and trail jostle each other. The walls rise steeply for nearly 1500 ft. on either hand. Farther on the valley widens into a roughly semicircular form, and to the east is the huge glacial cirque known as the Amphitheatre, with walls rising to over 11,000 ft. From all sides streams pour down through canyons of great beauty. With its hot springs and other attractive surroundings, Ouray will always excite the interest and admiration of the visitor, whatever may be his taste.

The history of Ouray began about 1875. The railroad that gave impetus to its development arrived in 1887. Ouray is one of the best localities to study the geology of the San Juan. From the Algonkian quartzites in the canyon of the Uncompahgre to the San Juan tuff that caps the summits of the surrounding mountains, the entire geological column is well exposed. The Paleozoic and Mesozoic sediments dip to the northwest at a gentle angle. The ores occur in all horizons between the quartzite and the tuff, and in some cases even extend into the latter. The replacement deposits are generally in limestone or sandstone (quartzite). One of the best examples of this type of deposit is the Mineral Farm mine, which for many years has been working a replacement near the top of the Ouray (Devonian) limestone, about a mile south of Ouray. Recently Mr. Duprau, the superintendent, by a clever combination of geologic reasoning and 'gumption,' has opened up another large body to the south of the old workings. The ore lies partly in the Ouray limestone and partly in a thin bed of cherty conglomerate, the lowest bed of the Hermosa (Lower Carboniferous) formation. Immediately above this is a thin bed of shale that has been faulted and changed into a tight 'talcose' band, which has served to confine the rising solutions and to limit the zone of ore deposition. The ore extends downward from this horizon, and is at present opened up 200 ft. east and west and 850 ft. north and south, dipping south with the contact between the Hermosa and the Ouray about 25 ft. per 100 ft. Galena predominates, with associated tetrahedrite, which carries the silver. It is treated by crushing with stamps and then concentrated on bumping tables and vanners; the tailing is run to waste over long and wide canvas tables, where a good saving is made.

The deposits around Ouray possess great interest and have often been described. I shall only mention a few of the more important features. Noteworthy are the curious clastic dikes, first described by Ransome. These occur in several places in the Mesozoic rocks, and consist of fragments of sedimentary rocks of a different nature from the enclosing walls, thus distinguishing them from fault-breccias, which they otherwise resemble. Ransome[4] has suggested that when fissures had opened through the sediments, fragments of the overhanging shale falling into the opening were afterward consolidated by pressure. Rickard[5] believes that the filling came from the forcing upward of underlying shale by pressure. Irving[6] has suggested that, being made up of sandstone and shale fragments, the dikes had an original composition approaching that of portland cement, and upon the passage of thermal waters through them they 'set'. This, much better than the pressure theory, would serve to explain the way in which fine stringers from the dike branch off into the walls.

Of the former producers, only a few of the more important can be mentioned. The American Nettie was an interesting replacement in quartzite that produced large amounts of good ore, but is now nearly exhausted. The Bachelor, in common with two or three smaller companies on the same vein, took out large quantities of ore from a persistent vein. It was in the workings of the Bachelor that the clastic dikes were first observed. The Bright Diamond mine had two sets of workings, in one of which the usual lead-silver ores occurred; in the other a deposit of pyrite, magnetite, and garnet; this had a good gold content, but was too refractory for profitable treatment. Among the present operators are the Calliope Tunnel & Mines Co., which has consolidated several properties in Dexter gulch and is working on a larger scale. Another is the Chipeta tunnel, being driven in the hope of cutting extensions of the large orebodies formerly mined. The Ouray Consolidated is similarly driving an adit to intersect several veins.

In the early days Ouray was a smelting centre, until the advent of the railroad made it more profitable to ship the ores. A few years ago another attempt was made to operate a smelter, but it was not a success, and now, with the exception of a small sampling works, nothing remains but some scattered machinery and partly dismantled buildings.

Ouray is the point of departure for the pack-trains that go to many mines situated on the mountain sides. It will readily be appreciated that in an area where the gradients are so excessively steep, mules or burros are the only practical means of transportation. The accompanying illustration (Fig. 7) shows a mule team loaded with planks, about to start for a neighboring property. Mules are usually tied together in a continuous string, while the burro-driver herds his train before him as he might a flock of sheep. It is a marvel of brute ingenuity to observe how a mule carrying 14-ft. planks manages to get around the exceedingly sharp turns or 'switchbacks' on the trail. They do it without mishap except at rare intervals. The burro is found throughout the San Juan, patient, willing, and unobtrusive, except at times, when, in the stillness of the night hours, the

[6] *Transactions* A. I. M. E. Vol. XXX, p. 231.
[5] 'Journeys of Observation.' Second Part. Page 17.
[4] *Bulletin* No. 260, U. S. G. S.

weltweh in his soul impels him to break forth into a song that, whatever it may express to him, is remarkably like the sound produced by actively filing a 4-ft. buzz-saw.

The largest mine tributary to Ouray is the Camp Bird, situated in Imogene basin near the head of Canyon creek. The early history of this mine is an unfailing topic of conversation where mining men foregather. After having made a substantial fortune for Thomas F. Walsh, it was acquired by the Camp Bird, Ltd., and is being vigorously and successfully worked by that company. The mine is at an elevation of 11,500 ft., and is opened by an adit about a mile long; raises extend above this for about 1000 ft., and winzes 900 ft. below. The haulage in

Fig. 7. Pack-Train.

the adit is by a Westinghouse electric locomotive, and the hoisting in the winzes and the lowering in the raises is done by electric hoists. All the power is electric, and is transmitted at 10,000 volts from Animas, Silverton, and Telluride, so that the plant

Fig. 8. Camp Bird Mine.

would not be closed down by the failure of any one transmission line. This is further prevented by a storage-battery plant of a capacity of 600 ampere-hours, always kept in readiness for an emergency. The men work in 8-hr. shifts. The wage scale is the usual one for the district, except that the machine-man and his helper each receive the same wage. About 100 men are employed. They receive good wages, live in the company's boarding-house (shown to the right in Fig. 8), where the food and accommodations are superior to those at the hotels in any but the larger towns. Billiard and pool tables, magazines and books, are provided also, and the total charge for all this is one dollar per day. The cost of living throughout the San Juan averages considerably over that sum. In spite of this it is difficult to obtain men; for several months in the winter it is almost impossible to get out because of the snow, and the average miner seems to object to placing himself in a position where he cannot reach saloons and gambling-houses when the mood seizes him.

The Camp Bird mill is on Canyon creek, about three miles below the mine. It contains 60 stamps, and treats 275 to 300 tons per day. Each stamp weighs 1050 lb., and drops 120 times per minute. Each battery is provided with 24 ft. of silvered plate of the same width as the battery. The overflow from the plates goes to 24 six-foot vanners. The tailing from these goes to classifiers, and the overflow from them to Wilfley tables, the spigot-product being reground in 5 Huntington mills, which crush through 35 and 40-mesh screens, the pulp flowing over 15 ft.

Fig. 9. Smuggler-Union Mill.

of amalgamating plates. Thence the pulp is concentrated on 6 more vanners, the tailing from these, combined with the Wilfley tailing, going to the cyanide plant. Here it is elevated by a sand-pump and classified in a 15-ft. spitzkasten. The slime overflows to waste, the sand being leached by percolation with 0.25% cyanide solution. The concentrate from the mill is sacked and 'packed' to Ouray, whence it is shipped to the smelter. It assays about 9 to 10% lead, 12 to 15% zinc, 11 to 15 oz. silver, and 2½ to 4 oz. gold per ton, and represents about 10% of the weight and 20% of the value of the crude ore. The total recovery of the gold is a little over 95½%. The total cost for mining, milling, and general expense per ton of ore is about $10, the cost of cyaniding the tailing being a little less than 70c. per ton, which seems high, considering how it is done. The former mill was wrecked by a snowslide on March 17, 1906, and totally destroyed by fire three days later. The work of re-construction was carried on at

a record-breaking pace, and the stamps were again dropping before the end of the year. Advantage was taken of the re-construction to increase the weight of the stamps and the length of the plates.

To Telluride one can go from Camp Bird mill by way of Mount Sneffles, passing the Virginius mine, and some promising prospects, or by way of the mine over the divide, at an elevation of 13,300 ft., to Savage basin and thence into Telluride, four miles away and nearly 5000 ft. below. Telluride, geologically, presents no striking contrast to Ouray. It is situated in a narrow glacial valley, now occupied by the San Miguel river and its tributaries. Along its sides lateral moraines are visible, and a few miles below Telluride, near Keystone, is the terminal moraine. The tributary valleys head in glacial cirques. How steep the slopes are is shown in Fig. 9, which shows the Smuggler-Union mill at Pandora, two miles above the Telluride, with the Bridal Veil fall in the background. The necessity for pack-trains for transport is easily appreciated from a glance at the zig-zag line of the trail on the far slope. The geological section exposed is higher than at Ouray, the lowest beds being Lower Carboniferous. The dip is slightly to the west, and the overlying volcanics form a thick series. Between Ouray and Telluride, on the heights to the west of Canyon creek, is an extensive flow of quartz-monzonite porphyry. In contrast to Ouray, most of the valuable deposits are in the Tertiary volcanics, rather than in the Paleozoic and Mesozoic sediments. The fissure-vein and the fillings of sheet-zones are the more important, although a certain degree of wider replacement is not lacking. The ore deposits of Telluride have been described at length by Whitman Cross and C. W. Purington.[1]

The veins of Telluride were discovered in 1875. By 1890 the railroad was completed to the camp. The three principal producers at Telluride are the Tomboy, the Smuggler-Union, and the Liberty Bell. The Japan-Flora and the newly developed Black Bear, said to be on an extension of the Tomboy vein, are also worth mention. The Black Bear was discovered and developed by Finnish miners. The Smuggler-Union has two mills in the valley, connected by long aerial tramways with the mine openings in the high basins to the north. The small mill has a capacity of 300 tons per day, and the larger one 350. The two mills are only about 200 yards apart. The Tomboy is managed in a most business-like manner, and an effort is made to extract the ore so as to mill a mixture representing the average grade of the reserves. Thus an average net profit of $40,000 per month is steadily maintained and opportunities to indulge in stock speculation are minimized.

The Liberty Bell mine and mill are among the most interesting in the district. The mine is in Cornet basin, and is connected by a two-mile aerial tramway with the mill on the banks of the San Miguel, just above Telluride. As the grade is heavy the speed is controlled by a double band-brake, and also by an absorption pump that pumps oil through a needle valve-like opening, the size of the opening determining the amount absorbed, its maximum capacity being 50 hp. The Liberty Bell vein has a strike of 50 to 60° southeast and dips 53° southwest. The average thickness of the vein is 3½ ft., though it is at times as wide as 10 ft. The hanging wall has been subjected to a small movement laterally to the southeast. The vein-filling consists of included wall-rock, frequently decomposed to a rather muddy mass, with longitudinal bands of quartz intermixed with calcite, which often shows well developed crystals. Pyrite is present in large amount, but galena, sphalerite, and probably sulphides of silver are important constituents. A perceptible amount of arsenic is present in the average mill-ore, which must exist in the form of oxy-salts, as in re-casting the chemical analysis there does not seem to be an equivalent of metallic bases to combine with it after the sulphur is satisfied. The quartz is often blackened by included oxides of manganese, and the vein is vuggy in many places. The large amount of clay in the ore makes it hard to handle in the tram-buckets and on the belt-conveyor over the mill bins. Neither does it run well on the foot-wall of the stopes, so a skip has been installed to let down the ore from the upper levels to the working level. The present workings are entered by a short adit to the vein, and a drift 4000 ft. on the vein. There are three other levels, 250 ft. apart, above the working level. The vein has also been cut 1000 ft. lower, by an adit 2800 ft. long. The lower adit is almost on the contact between the Telluride conglomerate and the San Juan tuff. Whether the vein will be profitable through the sedimentaries remains to be proved.

Fig. 11 shows the Liberty Bell mill. In the mill the ore from the tramway is distributed into the bins above the stamps by a belt-conveyor. There are 80 stamps of 850 lb. each, making 100 drops per minute, crushing through a 20-mesh screen. The capacity is 300 tons per day. When the silver in the ore is low, the ordinary screens are replaced by 14-mesh, increasing the capacity to 375 tons per day, and giving an equally good gold extraction. The plates below the batteries are 4 ft. 11 in. by 8 ft. Some of the plates have four drops in their length, some have three, and others two, but the increased efficiency of amalgamation often claimed to result from using a large number of drops is not conspicuously shown in the experience at this mill. The plates are kept soft. It is thought that this is made necessary by reason of crushing in cyanide solution, 1½ lb. KCy per ton being used. Why cyanide solution should harden plates is not obvious. It seems more probable that, since the cyanide solution always keeps the plates bright, it is possible to keep them softer without flowing than when the plates are partly discolored, and, of course, the thicker the mercuric film on the plates, the more favorable are the conditions for amalgamation. The overflow from the plates goes to Dorr classifiers, the slime from these to the cyanide plant, and the sand to 22-ft. tube-mills. The ground product from the tube-mills is again classified, and the sands returned to the tube-mills, so that the entire product is reduced to slime before being sent to the

[1] *Bulletin* No. 182. U. S. G. S.

cyanide plant. All the slimes on their way to the cyanide plant pass over an additional 8 ft. of amalgamating plate. The slime-tank, when full, is allowed to settle for 12 hr.; the clear supernatant solution is siphoned and run through a set of Moore filter-leaves before going to the zinc-boxes. The thickened pulp is run into a vat, where it is agitated for 12 hr. by a screw-propeller pump. It then goes to a 21 by 10-ft. filter-vat, where it is kept in circulation by three air-lift streams. The filtering is done by the Moore system. A noteworthy feature is the measuring vat for the cyanide solution, before it is sent to the zinc-boxes. This is a tilting vat. The

Fig. 10. Liberty Bell Mill.

jar is minimized by the use of a large umbrella-shaped submerged frame, which acts like a dashpot. The amount of solution is registered by an automatic counter. The cyanide tailing goes to the concentrating plant. Here it is classified into fine sand and slime. The fine sand is treated on Wilfley tables, and the slime goes over a large extent of canvas tables. What is caught on these is re-treated on vanners. The amount saved by this concentration is

Fig. 11. Camp Bird Mill.

not high, except when the silver happens to be abundant. Two-thirds of the gold is caught on the battery plates.

The Liberty Bell illustrates what technical training, combined with native ability, is able to do for a young man. Edward H. Nutter, himself a young Leland Stanford man, informed me that on his force 11 technical schools, colleges, and universities were represented in all sorts of capacities, such as sampling, assaying, surveying, as shift-bosses, and even as ordinary miners. The mill superintendent, W. E. Tracy, a graduate from the Columbia School of Mines, is probably the youngest as well as one of the ablest mill-men in Colorado. This is significant.

From Telluride there are several trails to Silverton. One zig-zags up the slope, leads through the Bridal Veil basin, over the divide. Another way is through Savage basin, turning to the east at the top of the divide and coming down into Red Mountain, whence there is a daily train to Silverton. The trail is not one to be lightly adventured at any time except

Fig. 12. On the Trail to Silverton.

in summer, as may be inferred from Fig. 12, photographed just beyond the crest. Skirting the western slopes of Red Mountain are Ironton and Red Mountain, once scenes of activity, but now, barring a few exceptions, very dull. Descending the slope, we come near Red Mountain, to the workings of the Guston, Genessee-Vanderbilt, Yankee Girl, Elbert, and other properties that have consolidated into one corporation. A long drainage adit has been driven to unwater them. From the summit, a little beyond

Fig. 13. Empire Zinc Smelter.

Red Mountain, down into Silverton is a 5.8% grade. The railroad is the first one built by Otto Mears after having done such splendid pioneer service in building wagon-roads. The San Juan owes more to his sturdy optimism and energy than is often realized.

On the outskirts of Silverton is a partly dismantled smelter that is eloquent of the fate that awaits any attempt to treat such ores remote from fuel and supplies, and where barren flux must be bought. I hold no brief for the smelter trust, nor do I deny that their charges are often excessive, but it seems

reasonably clear that a small plant, attempting to operate under conditions that are irregular and often adverse, is not a sound business venture. Silverton's list of former smelters is rather long, and some of the interesting features of the early days have been recited by T. A. Rickard.[8] It still possesses one plant that has lately been in operation, but the Durango smelter of the American Smelting & Refining Co. treats the larger part of the ores from this district.

Adjacent to Silverton are many large producers. Up Cement creek the Gold King Mines Co. operates a railroad to Gladstone, where the Gold King has an 80-stamp mill of modern design, with tube-mills for sliming. A stone's throw away is the Mogul, which operates a 30-stamp mill, with a complicated arrangement of jigs, tables, roasters, and with Blake-Morscher and Wetherill electric separators at the end. Up at the head of the little gulch to the east is as beautifully developed glacial cirque as a geologist could wish to see, but even his geologic fervor is not likely to make him oblivious to the delicious wild strawberries in the valley below it. Near Silverton are numerous productive mines. The Detroit & Colorado, Champion, Silver Wing, Sunnyside, Aspen, Iowa-Tiger, and Old Hundred, all add materially to the monthly tonnage. A railroad built by Otto Mears pushes its way up the canyon of the Animas, past Eureka to Animas Forks.

The most active property here is the Gold Prince, operating a new 100-stamp mill that is worth more than a casual observation. There are 10 batteries of 10 stamps each, and each battery is driven by its own 20-hp. 3-phase, 440-volt Bullock induction-motor. Thus it remains unaffected by a mishap to one of its neighbors. The plates are the width of the battery and 8 ft. long. Geared sand-pumps elevate the tailing to spitzlutten, which make first and second spigot-products and an overflow. The first spigot feeds 20 Wilfley tables. The tailing is reground in tube-mills. The concentrate is shoveled directly into buckets of 1000-lb. capacity running on an overhead carrier. The tables are driven by induction motors kept dry by suspending them from overhead framing. The rest of the mill was not in operation at the time of my visit, but the finer products are to be treated on 50 Card tables. The concentrate is dried on a steam-jacketed pan before being sacked for shipment, in order to save freight.

Before leaving Animas Forks the traveler should climb to the top of Wood mountain to see the majestic circle of the snow-clad peaks of the San Juan. Looking north one dimly descries the level line of the Grand River mesa, 140 miles away, while closer at hand tower the great peaks of Uncompahgre and his brothers. Just below is the rolling expanse of Poughkeepsie park. In the west peak after peak fades into the dim line of the distant La Platas. Southward the silver ribbon of the Animas winds down the valley 2500 ft. below, until it turns out of sight above Eureka. Here and there are inconspicuous lines of telephone and electric transmission, the latter without doubt the most significant feature in the present development of the San Juan. From Animas, Telluride, and Ouray they come threading the gulches and displacing the patient burro. One cannot escape the impression that the San Juan is no longer a "poor man's country." Gold placers were never here. The rich silver bonanzas have been largely extracted in the thirty years past. Large bodies of moderately low-grade ore, often difficult to mill, are still abundant; but only ample capital and thorough knowledge and experience can exploit them profitably. The day when pluck, endurance, and a little good luck could often make a fortune in the San Juan has gone by. Mining now demands money, good judgment, experience, and the utilization of every resource of technical knowledge.

No account of the San Juan would be complete without following the ore and concentrate shipments to their destination. The smelting plant at Durango treats a goodly quantity from the southwestern San Juan, but greater quantities find their way to Pueblo, Leadville and Salida. The base bullion produced is sent to Omaha for further treatment. The plant that is best adapted to the peculiar difficulties of the San Juan ores is that of the United States Smelting & Refining Co., at Canyon City (Fig. 13). Here is in operation the Lewis and Bartlett bag-house process, devised to solve the problem of smelting lead ores high in zinc and containing important amounts of the precious metals. It consists in volatilizing the lead and zinc as oxides, while the copper, gold, and silver remain in the residue, to be smelted for matte. The present operation differs little from the familiar description in Hofman's 'Metallurgy of Lead,' except that the side-feed of the roasting-hearths is no longer used, hand-feeding from the front being found more satisfactory. The 36 by 108-in. shaft-furnaces use an extraordinary amount of air, the aim being to eliminate the lead and zinc and to secure a white 'smoke' or fume. The fume is caught in unwashed woolen bags, and is refined in small roasting-furnaces to the grade commercially required as a pigment. The matte from the shaft-furnaces goes to matte-smelting plants. A similar larger plant is to be built about one and a half miles south by another company.

Between these sites is the plant of the Empire Zinc Co., which concentrates zinc ores in the wet way and also by Wetherill magnetic separators. The Leadville ores are not difficult to treat, as the zinc-blende they contain is the non-bearing variety known as marmatite, which is already magnetic enough to lend itself to direct magnetic separation. The San Juan zinc-blende, however, is the non-magnetic variety, and to separate it magnetically from pyrite it is necessary to roast enough to make the latter magnetic. This requires coal, and the resulting fume soon causes a disturbance among the owners of surrounding vegetation. So the owner of a mine the ores from which are too high in zinc to escape the smelter's penalty, too high in pyrite to make a good zinc concentrate, or high in precious metal (for which the zinc smelter does not pay), possesses a keen interest in every advance in ore-dressing and metallurgy.

[8] 'Journeys of Observation,' pp.60-65.

OREGON QUICKSILVER.

The last edition of 'The Mineral Industry' contains the following article by William B. Dennis, manager of the Black Butte quicksilver mine, of Lane county, Oregon: The reduction plant at the Black Butte mine, Lane county, was not operated during 1907. The year was consumed in installing a new plant. Some underground work was done, chiefly preparations for stoping. The mine itself had been extensively developed during previous years and large ore-reserves established. The property includes about 2000 acres of timber land and lies in the foot-hills of the Calipooia range, at the southern extremity of the coast fork of the Willamette valley. Several clearly defined lodes of cinnabar-bearing rock have been proved. The ore occurs chiefly along fracture planes, which show marked persistency in lineal and vertical extension. Along these fractures the ore-bearing solutions have penetrated the walls laterally for a great distance, forming wide orebodies. One main central fracture, outcropping along the apex, virtually cuts the mountain in two longitudinally. This fracture has been traced in a continuous line for two miles, showing ore-bearing rocks at every exposure. The richer portions of the lode usually lie along the walls of the fractures, forming payable orebodies ranging from 8 to 80 ft. wide, and containing an average of from 0.25 to 0.95% mercury.

The rocks of the region are of volcanic origin, tuffs being abundant. The extent of alteration is so great that it is difficult to determine the original composition, but geologists who have examined the district have generally agreed that they are originally andesites. The problem in the operation of the Black Butte mine has been to treat the large low-grade orebodies at a profit. Former owners had erected a 40-ton Scott-Huttner furnace of the California type. The operation of this plant proved unprofitable, as it saved only 33% of the metal. The fir-wood of the district, used for fuel, produced an enormous amount of soot, which retarded condensation, and made a second treatment necessary in order to free the quicksilver from the soot. In 1906 there was erected an experimental furnace on new and original lines, and the design was patented. Perfect combustion was accomplished, soot entirely dispensed with, and a high percentage of recovery secured. The roasting period was cut down from 24 to 6 hr., thereby greatly increasing the furnace capacity per unit of hearth area. Along the lines of the new process a plant, including alterations to portions of the old plant, was erected during 1907, and on February 1, 1908, the fires were lighted. The ultimate success of the new plant still remains to be demonstrated, but in the early part of March the outlook was favorable.

The new plant is equipped with a hydro-electric power which supplies current for lighting the buildings and mine, and power for the operation of the crushers and the two 70-in. Sturtevant exhaust fans. These fans furnish artificial draft for the furnace, as well as for the wood-gas producer, which is also one of the new features of the plant. A Sturtevant coarse ore steel breaker and a fine ore Gates crusher have been installed, and bin capacity for 700 tons has been provided. The ore is delivered to the furnace by an aerial tramway 3000 ft. long. The condensing plant has been erected along new lines and forms one of the novel features of the plant. The new dryer, constructed of concrete, steel, and brick, has a net capacity of 125 tons.

CHILEAN PULVERIZER.

Written for the MINING AND SCIENTIFIC PRESS
By DOUGLAS WATERMAN.

The accompanying cut is typical of the pulverizer to be found in the assay-office of every Chilean mine.

It consists of a circular cast iron plate with rim and spout, with an iron muller weighing over 200 lb. The stem is about 3 ft. long, and the muller may be operated conveniently from a standing position.

The sample as it comes from the mine is first spread on the plate, and the large pieces broken

Chilean Pulverizer

with a hammer. If the sample is of large bulk, it is coned and quartered in the usual manner, the spout facilitating the thorough cleaning of the plate. The muller is then brought into use. It has a slightly convex face, and both a rocking and revolving motion is imparted to it with the expenditure of comparatively little labor on the part of the operator. By the combination of motions the muller may be made to travel over the surface of the plate, the crushed ore being loosened and the coarser particles brought to the surface by gently tapping with a broom. The sample is quartered on the plate as grinding proceeds, and the final assay-sample reduced from 30 to 100-mesh in a Wedgewood mortar.

The method is a fairly rapid one, but has no points of superiority over the mechanical crusher and buckboard.

Gypsum occurs in several forms which differ in form, texture, and color. The most common form in which it is found in workable deposits is as massive or rock gypsum. Alabaster, occasionally used for statuary, and gypsum earth or graphite are other commercial varieties. The pure mineral is white and, when in crystalline form, translucent. The impurities which it commonly contains usually destroy the translucency and affect its color, so that the mineral as mined is an opaque finely grained mass, varying from white to reddish gray or brown in color.

RAND SAMPLING PRACTICE.

Written for the MINING AND SCIENTIFIC PRESS
By J. S. OLVER.

*The problem of taking an equal weight over the width of a reef is not as simple as it would appear. The face to be sampled seldom presents a flat surface, and when it does so it is often so hard that it becomes a physical impossibility to take a sample from it. On an irregular surface the prominent parts are naturally the most easily chipped off, and it is often impossible in such a case to cut an even sample straight across. I think it good practice in this instance not to confine oneself to a given line, either perpendicular or diagonal to the plane of the vein, but to depart slightly on either side of the true line. In taking a sample in this way it is essential that the portion taken on one side of the line be in the same horizon as if it had been taken on the line.

A heavy sampling pick should always be carried, in addition to the hammer and chisel. Not only is the former indispensable when examining a stope or drift, but a sample can be taken both more quickly and more accurately with it in soft or shattered ground. When the pick is used the sample should not be caught directly in a dish, but in the hand, because it is impossible when the ground is shattered to insure that only the required portions of rock fall into the dish. Every piece of rock which goes into the sample should be followed with the eye, and its comparative size estimated. No chips which have missed the dish should be picked up from the ground. When a large piece has been broken off, and it is necessary to reject a part, the sampler must be sure, before he proceeds to break the stone, that he knows exactly how it lay in place; otherwise an excess may be taken from one horizon and nothing from another.

The mistakes to be feared are those which are the result of a constant personal bias in one direction. The law of averages is always on the side of the intelligent and careful sampler, since it tends in time to eliminate accidental errors, but it does not help the man who works on wrong principles. The personal bias of an untrained sampler is almost invariably in the direction of excess in value. One of these dangerous tendencies has been indicated in the liability to take more than the fair share of the richer portion of the vein. The most common and the most difficult to avoid is in correctly measuring the width of the sample. This error tends in the great majority of cases to produce too high a value. A measurement along the face will always be too great, except where the face lies in a plane perpendicular to the plane of the vein, and the measuring rule is held perpendicularly to the plane. All measurements should be taken with a 2-ft. rule, which is preferable to the tape, but when more than one sample is taken in a section a check measurement, with the tape, if necessary, should always be taken across the whole width and compared with the sum of the widths of the samples and of the intervening waste rock. An excessive estimate of width is likely to be caused when a channel is being cut through tough rock. It often has a tendency to thin out to a knife-edge at the top and bottom. If the measurement is made to the extreme ends of the channel, too high a value will be obtained. Only a portion of the shallow end of the channel should be taken into the width. If this error is not avoided, a further bias toward excessive value will be established.

It must be noted than when some waste rock on either side of the reef is taken into the sample, as it always should be in the case of a distinct leader, the width of waste must be included in the sample width. I have seen a block of ground condemned as unpayable through ignorance of this seemingly self-evident principle.

An error peculiar to stope sampling which must be carefully avoided is the common one of underestimating the stoping width. The reason for this error is that the narrowest part of a stope is nearly always at the face, and therefore the width where the sample is taken does not represent the average width of the stope. The sampler should always measure the full width at the face in order to check the widths of his samples, but he must not accept that as the stoping width. The latter width must always be taken at some distance from the face, where the permanent width of the stope can be determined. When the hanging wall is not good, especially where machines are being used, the sampler must use his judgment as to what the ultimate width of the stope is likely to be, and he should make a liberal allowance for shattered rock falling away from the hanging wall at some distance from the face. This stuff is sure to become mixed with the ore, and as it is either waste rock or ore of very low grade, it must reduce the value of the stope. The tendency to under-estimate stope width is another instance of bias toward excessive value.

The most elaborate and rigid systems with which I am familiar on the Rand is one which insists on continuous samples of each reef being taken throughout the mine. In the case of a narrow leader, the whole surface of the vein is chipped, from the beginning to the end of the section, each section being 10 ft. long, while in the case of the wider veins continuous zigzags are cut out from top to bottom of the vein and from end to end of the section. This system is certainly thorough, and theoretically there is nothing wrong with it except perhaps that a series of parallel and equi-distant channels across the vein would be preferable to the zigzags, seeing that by the former method each imaginary lamina of the vein would be sampled at regular intervals. But, assuming that this is the most accurate system, is it worth the extra time and trouble? I am convinced by results obtained in several mines that the actual sampling can be done with a maximum probable error of 5%. I refer to the simple system of taking samples of each band of reef at intervals of 10 ft. in the case of reefs of average uniformity, and of 5 ft. in the case of a very patchy vein. Every estimate of milling grade calculated from development must be made upon an assumed stoping width and on an anticipated percentage of sorting, and the

*Abstract of a paper read before the Institute of Mine Surveyors, Transvaal.

probable error of these together certainly would not be less than 5%. I therefore hold that it is a waste of time to try to reach a maximum probable error of less than 5%. I will go further, and dispute the pre-eminence of the continuous system in point of accuracy. It is a physical impossibility in the average Rand formation to cut out the even grooves which are demanded in this method. The vein is so hard in places that a chisel will scarcely scratch it. In other places the rock breaks off in large lumps or flakes, and where these variations occur within the length of a section, as they constantly do, it is difficult to keep an even weight throughout the sample; while, if the whole length of the section exhibits a shattered surface, the sample becomes unwieldy.

This system does nothing to overcome the personal errors, with the single exception that it does not allow the sampler to select the best-looking spots in a patchy vein; but the best safeguard against errors of that kind is to employ reliable men, and to teach them the principles of sampling. I consider any system of sampling hopelessly wrong which aims at converting the sampler into a machine. The human factor cannot be eliminated from sampling, and, if it were, the greatest value of the work would be lost. A sampler, if he is not lacking in keenness and in powers of observation, should obtain an unequalled knowledge of his mine, and it is difficult to overestimate the economic value of this knowledge. A system which is too rigid and too laborious is not well fitted to develop observation and judgment.

Another system in use on the Rand which I consider to be open to objection is that of taking a section across the whole face, including all the bands, into a single sample. The cost of assaying may be reduced in this way, but I feel sure that this is not true economy. More than half the value of sampling lies, not in deciding whether a stope or drift is payable or not, but in supplying information as to the payability of the various layers of the vein.

In another variation of the system a composite sample is made up from all the samples taken from a single leader from top to bottom of a stope. In this method each leader is kept apart from the others, and it therefore meets the demand that every band of the vein should be separately considered; but it has objectionable features of its own. When samples are sent in for assay separately the return of an abnormal assay from any part of the vein immediately attracts attention; a panning is made, and the work is checked, either in the assay office or underground; but a marked contrast in value between one sample and others taken from the same vein is not readily detected when all the samples are put together for assay. Yet one rich sample, inadvertently mixed with several others of low grade, might well make all the difference between payability and unpayability in the average ore, even though that average might not appear to be abnormal. The disturbing value need not necessarily be due to careless work. It often happens in the case of a patchy vein that one sample comes out abnormally high, while the others show little gold. The average stoping value may appear to be satisfactory, but a careful sampler will hesitate to accept such a result, and will either repeat the work or cut down the value of the abnormal sample. Again, one of the main objects of sampling is to insure that the proper leaders are being carried, and one of the readiest indications of a mistake in stoping or development is a sudden loss of value. When composite samples are made up, a change in value is scarcely noticeable unless it takes place over a great part of the stope. My final objection to composite samples is that when this method is used it is almost impossible for anyone, on examining the sampling records, to detect mistakes due either to slovenly work or to wrong identification of veins. The undoubted saving in cost of assaying does not, in my opinion, justify the adoption of these methods, and it is easy to exaggerate the economy effected, because it must be remembered that a reduction of, say, 20% in the number of assays is not under ordinary conditions accompanied by a proportionate reduction in the cost of running the assay office. It seems to be quite unnecessary to displace the simple method of taking a single section at regular intervals across each band of vein. It is not only the simplest system, but the most rapid; and in the long run it is as accurate as necessary for any practical purpose. A distance of 10 ft. between sections will not be found too great for veins of average uniformity, but patchy lodes should be sampled more closely.

If an even weight per inch is taken in each portion of the composite sample, it is not necessary to keep those portions apart underground, and the whole may be put into one sack. Each portion is measured separately and the average width taken as that of the sample. When this is done, care must be taken that the wider and narrower parts of the leader are represented in the sample according to their lengths along the strike or dip of the vein. This method prevents the unnecessary multiplication of samples, and it gives excellent results; but it should not be used where there is any doubt about the continuity of a leader. The adaptability of this system makes it especially suitable to the sampling of working stopes. The rate of advance of stope faces is variable, and the system should be altered to suit these conditions. When a face is advancing 30 ft. or more per month, the average value of the rock broken during the month will be ascertained with greater certainty by sampling the face twice at intervals of 15 or 20 ft., than by a single sampling, however thorough it may be. Before the stoping values for the month are finally worked out, the surveyor's stope-sheets are examined, and only those samples are included in the average which fall within the area worked during the month. Samples taken in other parts of the stope are carried forward, and only those parts which have been worked in one month are sampled in the next. In this way a record of the whole stope-face is kept up, and a valuation of any part of it can be readily made, while the duplication of samples is avoided. A record of this kind makes it comparatively easy to trace the various leaders throughout a stope.

WASTE FROM BEE-HIVE COKING.

The coal consumed in retort ovens in 1907, according to the U. S. Geological Survey, amounted to 7,460,587 short tons; the quantity of coal used in bee-hive ovens was 54,485,522 tons, from all of which the possible by-products were apparently wasted. On the assumption that the coal consumed in bee-hive ovens was of the same average quality as that charged into the retort ovens, and that the prices would be not less than 80% of those ruling in 1907, the value of recoverable products which were thus apparently wasted during the year amounted to $44,000,000, a sum equal to nearly 80% of the total value of all the coal used in bee-hive ovens during the year. At the prices which prevailed in 1907 the value of the by-products wasted in bee-hive ovens during the year was a little over $55,000,000.

It should be remembered, however, that bee-hive ovens are situated in the coal-mining regions, and that the cost of the coal charged into them represents only a little more than the expense of mining; whereas in locating by-product recovery plants provision must be made for marketing or utilizing the by-products. For this reason most of the recovery plants are established near the larger cities, and at a considerable distance from the mining regions, and the expense of transportation is thus added to the mining cost of the coal. The cost of the coal charged into the by-product ovens in 1907—7,460,587 tons—was $15,874,430, or over $2 per ton, but the cost of the coal used in the bee-hive ovens was only $1.05 per ton. The original cost of installation for a by-product plant is four to five times that of a bee-hive plant of equal capacity. These disadvantages are in turn partly offset by the higher percentage yield of coke in the retort ovens and the lower delivery-charge on the coke produced. In bee-hive oven practice the expense of railroad transportation is borne by the coke; in retort-oven practice nearly all of the freight charge is borne by the coal.

The total value of the by-product coke produced in the United States in 1907 was $21,665,157, an average of $3.86 per ton. The value of the 35,171,665 tons of bee-hive coke made in the same year was $89,873,969, or $2.56 per ton. If the difference in value of the by-product coke and bee-hive coke was due only to the difference in freight charges, then the total value of the entire product of bee-hive coke made in 1907 would, if made in retort ovens close to the market, have been $135,750,000. If to this be added the value of the by-products that should have been recovered—$44,000,000 at 80% of the market value in 1907—the total value of coke and by-products would have amounted to nearly $180,000,000 instead of $89,873,969 for the bee-hive coke alone, being a gain of about $90,000,000. On the other hand, the cost of the coal charged into the ovens would have been $108,879,870, instead of $56,956,000, this being added expense of about $52,000,000, making the net gain about $38,000,000. This sum, less the difference in the operating expenses, wear and tear, interest on capital, and so forth, may be considered as approximately the actual net loss in 1907 as the result of the production of coke in bee-hive ovens rather than by-product ovens. One of the reasons that has been given for the apparently slow progress in retort-oven building in the last four years is the lack of profitable markets for the by-products of coal tar, and this condition has contributed to the backwardness of the United States in the development of chemical industries depending on coal-tar as a raw material; yet this country is importing coal-tar products to the value of several million dollars annually. It is also well known that the development of the coal-briquetting industry has been retarded because of the lack of assurance of a satisfactory supply of suitable coal-tar pitch for binding material; moreover, there is an increasing demand for creosoting oils for the preservation of lumber. There does not appear to be any trouble in disposing of the ammonia, for which a good demand exists, and the practicability of long-distance transmission of gas has been demonstrated. E. W. Parker says: "When the economies which may be effected by the use of retort ovens have been so clearly demonstrated, not only by the plants which have been constructed in the United States, but more emphatically through the extensive development of by-product coke manufacture in Europe, the condition in the United States, as shown by the statistics of the last four years, is difficult to understand."

Railroad Building.—The Alaska Central runs from Seward, a deep-water port on Resurrection bay, which is about in the centre of the south coast of Alaska, north toward Fairbanks, on the Tanana river. The road is standard gauge, laid with 65-lb. rails. The maximum grade is 1%, except over two mountain ranges, where it is 2.2%. The maximum curvature is 14°. The cuts and fills are heavy and there are seven tunnels and many trestle bridges. The cost of 54 miles of road was $3,230,000. This includes cost of organization, but not cost of rolling stock, station buildings, docks, office fixtures, etc. The cost of separate sections, starting from the terminus at Seward, was as follows:

7	miles at	$20,000	$140,000
9	" "	40,000	360,000
18	" "	55,000	990,000
7	" "	35,000	245,000
5	" "	80,000	400,000
2	" "	50,000	100,000
4	" "	100,000	400,000
2/3	"	tunnels	300,000
1 2/3	"	approaches	295,000

The cost per mile of the above 54 miles was $60,000. Deducting the 2 1/3 miles of tunnels and approaches, the cost per mile of 52 miles was $51,000. The two-thirds of a mile of tunnels cost at the rate of $450,000 per mile, and 1 2/3 mile of approaches, $177,000 per mile.—*Railroad Age-Gazette.*

The deepest bore-hole is at Paruschowitz, in Upper Silesia. This is 6573 ft. deep, commencing with a diameter of 12.6 in. and ending with 2.7 in. Mannesmann weldless steel tubes were used for boring-rods.

Empire Hand Prospecting Drill.

The need for an inexpensive and reliable prospecting apparatus for placer work has been keenly felt, and there is no reasonable doubt that considerable placer ground is lying untouched today because of the cost of sampling with power machines. The Empire Hand Drill, manufactured by the New York Engineering Co., offers a solution of the difficulty. It is low in first cost, and the cost of sinking test holes with it is cheaper than by any other known means, and the results are accurate. The amount of labor involved in operating the drill is small, five men and a horse being all that is required, and while the operating expenses are low, from 20 to 50 ft. of 4 to 6 in. hole can be drilled per day, according to the nature of the ground.

An important feature of this drill is the method of driving the casing. This is done by mounting four men on a circular platform screwed on the top of the casing. These men operate the drilling tools inside the casing, while the platform and the casing are rotated by a horse walking around in a circle, and connected to the platform by a sweep attachment, as illustrated; or three of four men may rotate the casing by long wooden handles attached to the platform.

Pulling Cap.

Drill Handle.

Four men standing on top of the platform give a combined weight of from 500 to 600 lb. The platform will weigh nearly 300 lb. To this is added the weight of the drilling tools and the drill rod every time it is lifted by the men; so there is a total weight of over 1000 lb. generally applied in sinking the casing. The rotation of the casing is most important, as it keeps it loose, and it is due to this fact, together with the weight of the men, that the casing usually requires no driving, but sinks into the ground as fast as the core is drilled and removed. Driving the casing destroys both the casing and the joints, and also forces the casing into the ground so hard that it requires enormous effort to pull it. The casing, which is equipped with a sharp toothed cutting-shoe, aids in preparing the core for drilling, and a sand-pump picks up the gravel. Three operations take place at once—that is, the casing is driven or sunk, the core is drilled, and is also pumped, all at the same time; whereas, with all other drills these three operations are done separately and require a change of heavy tools between each operation. The material is removed as soon as it is detached from the core by drilling. This operation proceeds close to the bottom of the casing, or as soon as the core enters the casing, but can never take place below the bottom, owing to the relation between the section-lengths of the rods operating the tools inside of the casing, and the section-lengths of the casing itself. Thus one cannot drill below the casing except when a boulder or buried timber is found. A special drilling bit of extra length is then used for drilling through the obstacle.

Drilling is done by the four men on the platform raising and dropping the rods with the cutting tool attached to the lower end as if they were working a churn drill. A special handle is provided for gripping these square drill rods at any point.. The men are not obliged to twist the drilling tools, for the continuous rotation of the casing and platform on which they stand rotates the men and the tools also.

The core is drilled with the regular drill pump. When the pump is filled, it is raised to the surface by disconnecting the rods, and the contents are examined. On completing the hole to bedrock, a bottom sample may be obtained if it is fairly soft, by using the drill-pump with the augur-end attachment. This will bore its way into a soft bedrock and bring up a solid core. The casing is readily pulled by attaching a special pulling cap to the top of the casing, and then a long pole as a lever, with an adjustable fulcrum or pulling stand. Five or six men will be sufficient to pull the casing. The weight of the drilling apparatus is about 1000 lb., and no single piece weighs over 75 lb., except the platform, which can be readily separated into four pieces, each weighing about 75 pounds.

Using Ram to Sink Casing.

Drilling in Oregon.

In some recent drilling in Trinity county, California, the records show the following percentages of time devoted to the different operations: 78% in actual drilling, 7% in pulling casing, while 15% of the time was devoted to moving the drill from hole to hole. The small amount of time devoted to pulling the casing shows the ease and facility with which this is accomplished, and it will be noted that most of the time was devoted to actual drilling; also that no time was lost for repairs. The drill is made entirely of steel, no cast iron being used, and it is of such form and construction that it is rendered almost unbreakable. The apparatus has an exceedingly high drilling efficiency, averaging, in some ground, as high as 50 ft. of hole per day, at a cost of 25c. per foot.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

MINING CLAIM—AMENDING DECLARATORY STATEMENT.

The filing of an amended declaratory statement of mining claims, under the statute of Montana, cannot create a right of possession or location in the premises claimed under the first location, which did not exist prior to the filing of such additional certificate. It can confer no additional right, and is therefore evidence of none against any intervening or pre-existing right of another. Hence, except as against such intervening rights, an additional certificate serves the same purpose, in its admission as evidence, as that of an original location-certificate, and will relate back to the first location. The intent of the statute is that the additional certificate, or amendatory declarations, show opportunity to cure defects in the original, and thereby to put the locator, where no other rights have intervened, in the same position that he would have occupied if no such defects had occurred.

Milwaukee Gold Extraction Co. *v.* Gordon, (Mont.) 95 Pac. 995, May, '08.

PLACER CLAIM—LOCATION OF DISCOVERY SHAFT.

The fact that one-half of the diameter of the discovery shaft was on an oil-placer mining claim, was held to be a sufficient showing of discovery within such claim; and such claim would not be invalidated by the fact that such discovery shaft was partly on another claim. Neither would it be inferred that the well deviated away from such claim in its descent, in the absence of evidence to the contrary.

Phillips *v.* Brill, (Wyo.) 95 Pac. 856, May, '08.

CONFLICT OF MINING CLAIMS—ADVERSE SUITS—PROOF.

In a contest to determine the title to conflicting mining claims, in order to make out a prima facie case, the plaintiff must show, in addition to the other legal requirements, that the conflicting claim was not covered by a prior location, or, if so, that it was invalid; or that such prior claim had been forfeited for non-performance of annual labor, or that the claim had been abandoned.

Lozar *v.* Neill, (Mont.) 96 Pac. 343, June, '08.

CONVEYANCE OF MINING CLAIM—PAROL EVIDENCE OF CONSIDERATION.

Where tenants in common conveyed a definite portion of a mining claim, and the deed was silent as to the terms, parol evidence was admissible to show that the conveyance was made under an agreement, as a part of the consideration, that work done and discovery made by the grantee should inure to the benefit of the grantors.

Merced Oil Mining Co. *v.* Patterson, (Cal.) 96 Pac. 90, May, '08.

FORFEITURE OF MINING CLAIM—RE-LOCATION.

A person attempting to re-locate a mining claim on the ground of forfeiture of the original location for failure to make the required improvement, has the burden of establishing such forfeiture. This may be done prima facie, by proof that no labor was performed within the limits of the original claim during the required year. In a case where such prima facie case was made it was held that the burden then shifted to the original locator to show that work performed on an adjacent claim inured to the benefit of the controverted claim.

Fredricks *v.* Klauser, (Ore.) 96 Pac. 679, July '08.

MEANING OF 'IMPROVEMENTS' ON A MINING CLAIM.

The word 'improvements' as used in the United States statute, requiring the making of certain annual improvements on a mining claim, was held to mean such an artificial change of the physical conditions of the earth in, upon, or so reasonably near a mining claim as to evidence a design to discover mineral therein or to facilitate its extraction, and in all cases the alteration must reasonably be permanent in character.

Fredricks *v.* Klauser, (Ore.) 96 Pac. 679, July '08.

Catalogues Received.

The WESTERN ELECTRIC Co. has just published a small booklet on lead-covered telephone cables.

The WESTERN ELECTRIC Co. has lately published its Bulletin No. 5910-8 on electrical equipment of mines.

The C. H. SHAW PNEUMATIC TOOL Co., Denver, is distributing its Bulletin F, describing its No. 9 slugger drill for stoping work.

The STROMBERG-CARLSON TELEPHONE MFG. Co., Rochester, N. Y., is prepared to distribute copies of its bulletin describing the Mine-A-Phone system.

THE CYCLONE DRILL Co., Orrville, Ohio, has recently issued its Bulletin No. 1, which is a description and price-list of the different types of its No. 10 machine.

The GOODMAN MFG. Co., Chicago, has issued, under date of September, 1908, its Bulletin No. 101, which describes and illustrates the Goodman chain breast machine for coal mining.

THE BIRD-ARCHER Co., New York, is distributing a comprehensive statement of the advantages in using its line of boiler compounds. The pamphlet is called 'Boiler Troubles.'

The STROMBERG-CARLSON TELEPHONE MFG. Co. has recently published its Bulletin No. 1000, on mine telephones. This pamphlet is the first of a series which will eventuallly illustrate and describe its entire line.

THE KILBOURNE & JACOBS MFG. Co., Columbus, Ohio, has lately issued a folding circular describing its line of pressed steel and riveted utensils, which includes ore baskets and utensils that may be used around mines and smelters.

The JOSHUA HENDY IRON WORKS, San Francisco, has lately published its Bulletin No. 111 on hydraulic gravel elevators and water lifters. It contains much valuable information on the duty of the miner's inch and the loss of head, due to friction, in the flow of water through pipes.

The AMERICAN SPIRAL PIPE WORKS, Chicago, has recently published its Catalogue No. 5, which is a handsomely printed and elaborately illustrated description and price-list of its line of spiral riveted pipe and forged steel flanges. The pages are replete with complete dimensions of and full information about all the regular and special appliances of this well known firm. A number of tables of useful information adds to the attractiveness of the book.

Commercial Paragraphs.

N. D. PHELPS, 217 Sheldon Bdg., San Francisco, is agent for the C. H. Shaw Pneumatic Tool Co., of Denver, manufacturers of the Shaw pneumatic air-hammer rock-drill.

The NATIONAL WOOD PIPE Co., Los Angeles, received a diploma of award from the New Mexico Territorial Fair, recently held at Albuquerque, for the best exhibit of wood pipe for city water works, irrigating systems, and power plants.

CHALMERS & WILLIAMS, Chicago, report a contract recently closed for a 20-stamp mill, including two sectional tube-mill and two sectional 36-in. by 20-ft. Burt filters, for shipment to the El Favor mine, owned by McKeever Bros., of New York.

A plant for demonstrating the Hendrix Electro-Chemical System as applied to gold ores has recently been opened at 605 Howard street, San Francisco. The apparatus consists of a combination of amalgamated plates and mercury riffles, the latter of special design. Hung above the plates and suspended as baffle-boards in the riffles, are thin strips of graphite. To the pulp is added a minute amount of soluble mercury salt, which is electrolyzed in passing over the amalgamator. The mercury is thereby precipitated in the pulp, by a current of from 2 to 15 amperes at a pressure of from 5 to 10 volts, the plates and the mercury in the wells acting as the cathodes and the graphite strips as the anodes. The working costs are low, and recoveries of over 95% have been made on suitable ores, and a nearly complete extraction of gold from black sands.

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EDITORIAL.

NOME'S production of gold for the season just ended is estimated at $5,000,000, which is $1,500,000 less than it was in 1907. Several dumps remain unwashed for lack of water, the precipitation this year having been scant.

A CALL has been issued for the eleventh annual session of the American Mining Congress, which will meet at Pittsburg on December 2. Among the subjects to be discussed are the Bureau of Mines, the Forest Reserve, mine accidents, and smelter rates.

COPPER STOCKS are booming. Since the panic of a year ago the shares of the leading copper-mining companies exhibit an aggregate increase in market valuation of $350,000,000. Amalgamated alone shows a rise of $75,000,000. Utah Copper has appreciated $25,000,000, and Nevada Consolidated, $16,000,000.

FROM AN ACCOUNT of the life of C. W. Morse, the promoter of the ice trust, recently sentenced to 15 years in a Federal prison, we learn that he was a director of 25 companies, including 5 banks and 2 trust companies. What an absurdity it is to suppose that any man can be responsible, as a trustee, for the proper administration of 25 companies. It would be well if no man could legally be a director of more than one bank or trust company. The trusteeship involved should not be allowed to degenerate into a fiction.

BY REQUEST of Mr. Gifford Pinchot, the president of the American Mining Congress has appointed a committee to investigate the effect of the National Forest Service upon the mining industry. The committee appointed by Mr. J. H. Richards consists of Messrs. A. G. Brownlee, E. A. Colburn, W. F. R. Mills, W. P. Daniels, and George J. Bancroft. Our readers are invited to transmit such information as may guide the committee in coming to a conclusion concerning the alleged interference with legitimate prospecting or any other form of mining. Such communications should be addressed to the Forest Reserve Committee at 1510 Court Place, Denver.

WHILE the work of the Forest Service is appreciated by us, it seems proper to protest against the deluge of literature sent broadcast through the mail at the expense of the Government. For instance, we have just received a circular announcing recent appointments in the service of the National Forests. This is waste of money. The appointments are not important, and the announcement of them in this way is unnecessary. The Forest

Service will get into disrepute unless it evinces some appreciation of thrift. National thrift in the preservation of the forests is laudable, but the thrift of the Foresters might well begin by less squandering of wood pulp in needless circularization.

BY THE ELECTION of Mr. Richard C. McLaurin as president, the Massachusetts Institute of Technology has chosen an eminent scholar and a strong chief. He is a man of broad training and wide scientific attainment, with a first-hand knowledge of the educational systems of England, Germany, France, Australia, and America. We are informed that Kelvin thought highly of Mr. McLaurin; he comes from an old family famous in the intellectual annals of Scotland, he has a large store of energy and business ability. The Tech. has been a notable incubator of first-rate engineers; may it prosper exceedingly.

MENTION was made, in a recent conversation with a smelter manager, of the scarcity of young men serving an apprenticeship in fire metallurgy. Cyanidation and wet concentration appear to be the vogue among the juniors, to the neglect of the older branch of the subject. We asked for the cause of this, and were told that the young fellows liked to go into the cyanide mills and concentrators because it enabled them to be near the mines; moreover, the number of enterprises using wet methods afforded a fairly good assurance of gaining an experience that could be made available in the future. In smelting, it is realized that the number of plants is limited, and most of them are controlled by one or two big corporations, managed by executive committees. The young men in the profession have an idea that promotion with the smelter trust, and its competitors also, goes by favor, and that tenure of position is, at best, precarious. Also, it is held that the advisory experts get the credit for good work, while the local manager is saddled with the blame of any blunder. For these reasons employment with the Guggenheims and other combinations is not as popular as it used to be. We state the facts as we get them, without prejudice. The expression of a contrary opinion will be welcomed.

Francis J. Heney.

Telegraphic dispatches will have informed our readers in the most distant mining regions that Francis J. Heney was shot while doing his duty in court. Some of our readers in Australia and Africa will want to know who Heney is. We shall tell them: Francis J. Heney is a fearless advocate who gave his professional services to Mr. Rudolph Spreckels when that public-spirited citizen came to the rescue of a municipality controlled by thieves. Heney became assistant to the District Attorney. He gave his time and his talents to the cause of the people without payment. He has been outspoken against the bribery of municipal officers by the tramway, gas, and telephone companies; he has fought against the throttling grasp of the Southern Pacific; he has insisted that the man who bribes is as base as the man who is bribed; he has emphasized the greater responsibility of rich and educated men as compared to that of the cheap tools elected to office by predatory corporations. Heney was formerly a student in the University of California, but he has a manhood such as the frontier develops; he is rough in some ways, lacking in culture in others; he is not as polished as Depew nor so tactful as Foraker, but he is gloriously belligerent and splendidly incorruptible. Straight, fearless, honest, he is the kind of man San Franciso has needed and will need; he is the kind of man America may be proud of producing. We pray that he may be spared for a long and useful life.

State Mining Bureau.

Reference was made recently in these columns to the mismanagement of the State Mining Bureau. Several persons have called our attention to an article on 'California Gold Dredging' by Lewis A. Aubury, State Mineralogist, appearing in the current issue of *The Pacific Miner*. We were inclined to believe that the article was published without the supposititious author's consent, for the middle initial is wrong; moreover, in the preceding issue of the same monthly periodical there was an article on 'Prospecting and Mining Gold Placers', by J. Power Hutchins. We learn from Mr. Hutchins that he did not contribute this article, and that it was taken bodily, without any sort of acknowledgment, from a bulletin published many months ago by the United States Geological Survey. On the whole, Mr. Aubury's article, in whatever way it reached *The Miner*, has found a fit resting place. The article as published is merely a reprint from a bulletin issued by the State Mining Bureau in May, 1905—three and a half years ago. It was not written by Aubury, nor was it written by J. E. Doolittle, whose name was attached to it when issued by the Bureau. The late Doolittle was at that time a trustee of the Bureau, and aspired to be known as an author on mining topics. But he did *not* write the treatise on dredging; nor did Aubury. The work was done by the late John D. McGillivray. Not one of the 'assistants' named by the State Mineralogist in his letter of transmittal did any more than Doolittle himself. The entire manuscript was prepared by McGillivray; he was probably told to interview Doolittle on the subject of the early history of dredging in California and this constituted the sum of Doolittle's share in the preparation of the bulletin. The Bureau paid McGillivray's salary and traveling expenses, proving that he did the work for the Bureau, although he was not properly credited. These facts are well known to the men engaged in dredging in California. The publication of this article in the *Miner* seems so foolish as to warrant the idea that it was done without Aubury's knowledge, but the plates used as illustrations are those appearing in the bulletin, and an editorial puff in the same issue of the *Miner* is also significant. However, we must assume that neither the supposititious author nor the supposed editor read the article for which they are jointly made responsible. The bulletin was written

in 1904, and the latest statistics quoted are those of 1903. It is a painful anachronism. We are informed that "it is proposed to build a dredge at Folsom with buckets of 13 cubic feet capacity". Several dredges with buckets of this size have been in operation for more than two years past. Other statements of an equally misleading character appear. The author states: "I purchased some of the land through Mr. Hammon." and "I suggested the Feather River gravels and with Mr. Hammon purchased 1000 acres." Of course, we know that although Aubury's name is given to the article, these statements were made by Doolittle, who was a promoter of dredging schemes, but they illustrate the weird mixture of stupidity and misrepresentation involved in the publication of the article as it appears in the *Miner*. Presumably the author and the editor responsible for this farce are what the daily papers would label 'savants'.

Responsibility of the Press.

On Friday afternoon, November 13, Francis J. Heney, Assistant District Attorney for the City and County of San Francisco, was shot by an ex-convict who had been in a jury impaneled to try a case against Abraham Ruef. The assassin was shown to be unfit to serve as a juror after he had been temporarily accepted, and the exposure had preyed upon his mind so that he attempted to kill the officer of the law who, in the exercise of duty, had been compelled to lay bare his past career. The shot that felled a brave and fearless prosecutor startled the sleeping conscience of San Francisco and excited a tremendous expression of public opinion. The significant feature of that expression of public opinion was, and is, the recognition of the fact that behind the act of a crazed individual, behind the failure of justice in this community, behind the contempt of law shown alike by poor ruffians and rich gentlemen, is a debauched press. New York has its yellow journals, such as Pulitzer's *World* and Hearst's *American*; Denver lives under the curse of the *Evening Post* and a weakly daily called the *Republican*; but San Francisco, of all communities speaking the English language, is afflicted with the bubonic rats of journalism—rats that infect the body politic with the filthy diseases of lying and corruption. The newspapers of San Francisco are owned by men without character and edited by men without principle. We say this without malice. Further, while the punishment of graft has been hindered by the opposition of the *Examiner* and the *Chronicle*, it is a regrettable fact that the cause of reform has been handicapped by the methods employed by the papers on the other side. Any just cause must suffer by the antics of the *Bulletin* and the vagaries of the *Call*. We remember that both those supposed champions of decency made a violent attack on the jurors who voted for the acquittal of Glass in the first trial, when the evidence was incomplete. This is as indecent and improper an action as a newspaper could take. Even today the *Call* publishes cartoons scarcely less vile than the *Examiner*. Reform cannot be proud of its newspaper advocates. This is not the opinion of a soured individual; it is the conviction of thousands of educated and professional men in this community. It has been said that a people generally gets the kind of government it deserves; is it true that a community is usually served by newspapers of a quality like unto itself? We hope not. We know of cities that have papers far ahead of the average intelligence and character of its citizens; such papers lead; such papers educate and uplift, more effectively than a university. At a time when Hearst has proved the power for evil of a prostituted press, we are glad to emphasize the fact that America has many splendid newspapers, and those newspapers are the basis of profitable business. The *Evening Post* of New York, the Boston *Transcript*, the Springfield *Republican*, the Baltimore *Sun*, the Chicago *Daily News*, the Portland *Oregonian* are great influences for good, and they are also profitable enterprises. No such newspaper exists in San Francisco.

At the mass meetings of citizens held during the past week there has been voiced an intense detestation of the subsidized press. It is believed that the daily poison of inuendo and slander has not only obstructed justice by tending to belittle the officers of the law, but it has driven ignorant men to such crimes as the attempt to kill Gallagher, the pivotal witness in many cases now pending, and it has culminated in the attempted assassination of Mr. Heney. Assuredly, journalism has never fallen so low as in the case of the Oakland *Tribune*, a paper so disreputable that anything it says about anything is of no consequence; or of the *Wasp*, which gets its sting from the manure pile. For the *Argonaut* there is no excuse; the editor of that famous periodical ought to know better, but he does not. He can imagine that no rich and successful "gentleman" can do wrong, and he harps on the vulgarity of a hero like Heney until his own vulgarity sickens the reader. His predecessor, Frank Pixley, sold himself to the Southern Pacific Railway company like a bushel of potatoes, and while the present editor of the *Argonaut* is, of course, above common bribery, he is obsessed with a mental snobbishness nearly as contemptible and quite as effective in the support of wrong. And all this is said by one who is not involved in any local quarrels, whether of business or politics; it is said by a sympathetic spectator, who loves and respects the fundamental principles of American civilization and is heart and soul in the fight for the betterment of representative government.

We do not write bitterly without warrant nor, we hope, uselessly. It is high time for the American people to recognize that the daily press has a power wholly out of proportion to the character or intelligence of the men that control it. The harm done by Hearst with his seven literary sewers every day in various cities of this country is incalculable; we regret to think that it is more potent for evil than the power for good exercised by the three or four able and forceful newspapers already mentioned. The clean papers are read by the few; the yellow journals are read by the many. By caricaturing honest men, by cartoons suggesting violence, by insid-

ious teaching that inflames weak minds, by these devices the murderer of McKinley was taught, by these devices the assassin of Heney was prompted. And if the Hearst papers are bad, even worse are such papers as the *Chronicle*, which publishes editorials full of indirection while its news columns are sold to the highest bidder. Men who may skip an editorial will read the news of the day, not knowing that it is inaccurate, if not deliberately falsified. The same is true elsewhere; of this tragic comedy it can be said: Time: Present. Place: Any large city in America. For the last two years the courts of this City have been occupied in trying men indicted for crimes of a fundamentally dangerous character, such as corruption of officials, bribery of jurors, assaults upon witnesses. Every case has been tried in the papers, in every instance a verdict has been given by the editors, in every instance the minds of the people—and especially of possible jurors—have been prejudiced, weeks before the case has been called in court. There is not an editor of a daily paper in this City who should not have been haled before a Judge for contempt of court. To the press of San Francisco must be laid the blame for the miscarriage of justice and the discredit of judicial procedure.

Postal Facilities.

Efforts are being made to improve postal communication with the mining settlements in the North. The Canadian post-office department has announced that the list of matter transmittable to the Yukon during the coming winter has been enlarged so that the only matter now excluded is newspapers and periodicals that are sent as samples or for trade, all papers intended for bona fide subscribers being accepted at third-class rates. In Alaska the American Government has made arrangements that will greatly improve the postal service, especially between Valdez and Fairbanks, which is the trunk line to the 'inside.' Last winter there was a delivery twice each week; this winter there will be 20 additional round trips with an average load of 800 pounds per trip, so that in effect there will be a triweekly service. Moreover, the post-office department has contracted for the movement of 32,000 pounds more from November 24 to April 8, so that provision is made for the better portion of the newspaper and magazine mail. This winter service will supercede communication by river-steamers, and, as a matter of fact, the mail delivery will be more frequent and more regular. The steamers do not run on schedule time, they are delayed while waiting for freight, and they miss connection, so that in summer it is not unusual for 20 days to be consumed in the passage of mail from San Francisco or Seattle to Fairbanks. In winter, delivery is assured within 12 to 14 days. Between Eagle and Gibbon, where the Tanana river enters the Yukon, the mail will be carried each way every two weeks between October and May, the total weight on each journey being limited to 400 pounds. From Eagle, down the Yukon, across the cut-off at Kaltag, to St. Michael, and thence to Nome, the postal service will be performed by the aid of dog-sleds, necessitating a limitation to the load transported, but it has been arranged to give better service than last winter by permitting not only all the first-class but also a large part of the second and third-class matter to be carried to the people exiled on the Seward Peninsula. Last winter the contract with the mail-carriers made provision for the delivery of 800 pounds per week; this year an additional weight of 6400 pounds is to be transported from December 10 to March 31, in 16 weekly trips, so that the increase amounts to 400 pounds per week or 50 per cent more. Last winter the arrangements provided for the delivery of letter mail and only a small portion of the second-class matter offered, but this winter the extra contract is expected to cover a considerable portion of the second-class matter and magazines. It may be explained that in regions where the mail delivery is limited, the preference is given to letters, and even the affixing of extra postage to bring newspapers or magazines within the rank of first-class matter will not ensure delivery, for the distinction is not as between first and second-class postage, but as between manuscript mail and printed periodicals. After letters, the first preference is given to newspapers and magazines in single wrappers sent by publishers to bona fide subscribers. When provision has been made for these, then the newspapers and periodicals mailed by individuals to friends are accepted. Lastly come sample copies, catalogues, and the like, all of which at present have no chance to get 'inside' during the winter of the North. Incidentally, it may be explained that the interior of Alaska, meaning the country north and west of the coast range, is called the 'inside,' in distinction to the rest of the world on the 'outside.' We hope to see that distinction gradually softened until it becomes merely a sentimental difference. Better transportation and quicker mail delivery will be the extinguishers of this geographical hiatus. To those not familiar with this part of the American continent it is well to state that the distance from San Francisco to Dawson is 2374 miles, from Dawson to Gibbon it is 700 miles farther, and from Gibbon to Nome the distance is 1000 miles. From Seattle to Valdez it is 1423 miles, and from Valdez to Fairbanks, over the winter trail, the distance is 352 miles. If anything can conduce to making the hinterland of Alaska seem less like a "non-contiguous" possession of the United States, it is improvement in the postal service.

THE SIMPLYFIDE Spelling Bored is at it again. The members of that board cannot be more so than we are. Their antics provoke in us a feeling of extreme lassitude. According to a recent statement, these reformers of spelling are proud of the fact that their simplified spellings appear in magazine advertisements, booklets of real estate men, circulars of brokers, and so forth. This they deem encouraging! We can testify frankly that when a contributor to this journal shows signs of simplification—by mutilation—of his spelling, we find his matter verbose, badly constructed, undesirable.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

LEWIS T. WRIGHT is at Salt Lake.

J. R. FINLAY is at Golconda, Nevada.

LIONEL LINDSAY has arrived in San Francisco from Colorado.

A. N. ROGERS is in charge of the North Star mine, Arizona.

W. H. WEED is at Los Angeles, and is going to Globe, Arizona.

H. L. BROWNE is superintendent of the Clara Consolidated Co., at Bouse, Arizona.

GEORGE W. WILKINS sails from New York for British Guiana on November 23.

NAT P. WILSON, of Denver, is manager of El Porvenir mine at Parral, Mexico.

ELTON W. WALKER is superintendent for the Tombstone Con. Mines Co. in Arizona.

ARTHUR S. DWIGHT was in San Francisco and is now on his way to Salida, Colorado.

J. H. HUTCHINSON, metallurgist with the Goldfield Consolidated, is in San Francisco.

R. B. HUTCHINSON is manager for the Rio Tinto Copper Co., operating at Terrazas, Mexico.

G. C. KLUG has resigned as manager for the Phillips River Gold & Copper Co., Western Australia.

S. E. BRETHERTON is in southern California and is expected in San Francisco on November 20.

H. C. HOOVER is expected in San Francisco in December.

H. E. WEST was recently at Cobalt, Ontario.

BARTLETT L. THANE, superintendent of the Eagle River Mining Co., Alaska, is at Berkeley, California.

J. H. FENNELL is now at the Poderosa mine, in the south of Spain, belonging to the United Alkali Company.

F. W. LINCK is visiting London, after having spent some time in the Ural mountains for the Platinum Corporation.

CLAUDE VAUTIN is visiting London. He is associated with several metallurgical enterprises in South America.

EUGENE P. KENNEDY, assistant superintendent of the Alaska-Treadwell mine, is visiting his home in San Francisco.

G. A. R. LEWINGTON, consulting engineer to the N. A. T. & T. Co., at Dawson, is spending the winter in San Francisco.

S. S. LANG, formerly with the Benito Juarez mines, in San Luis Potosi, Mexico, is engaged in geological work in Chihuahua.

H. J. BARON, former associate editor of *Mining Science*, Denver, Colo., is manager of the Mexican Chemical Co., Chihuahua, Mexico.

BERT PETERSON, manager of the El Rayo mine and mill, Santa Barbara, Mexico, has returned from New York and other Eastern cities.

FRED BURNS, formerly at the Alaska-Treadwell, has accepted a position with the South American Mines Development Co., in Ecuador.

JAMES HUMAS, formerly with the North Butte Co. at Butte, has accepted the position of general superintendent for the Austin-Manhattan Con. Company.

Obituary.

ALEX DRON was killed on October 11 in the Frost shaft of the Austin-Manhattan Con. Co., at Austin, Nevada. Mr. Dron was 67 years of age, a native of Scotland, and was well known throughout Nevada as a mining captain of great ability. He sunk the Frost shaft years ago, and was cleaning it out and re-timbering it for the above Company, when a sudden inrush of foul air caused his untimely death.

Latest Market Reports.

LOCAL METAL PRICES—November 19.

Antimony	12@16c	Quicksilver (flask)	$44@45
Casting Copper (scrap)	8½@13½c	Spelter	6¼@7c
Pig Lead	4.55@5.50c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Nov. 12. £. s. d.	Nov. 19. £. s. d.
Camp Bird	0 15 9	0 15 3
El Oro	1 5 0	1 7 0
Esperanza	3 3 9	3 3 9
Dolores	1 10 0	1 10 0
Oroville Dredging	0 8 9	0 8 9
Stratton's Independence	0 1 3	0 1 3
Tomboy	1 1 3	1 0 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Nov. 13	14.31	4.35	5.10	49⅞
" 14	14.25	4.34	5.10	49⅞
" 15	Sunday.	No market.		
" 16	14.25	4.34	5.10	50⅛
" 17	14.19	4.31	5.10	50⅛
" 18	14.19	4.31	5.10	50
" 19	14.19	4.31	5.10	49⅞

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Nov. 12.	Nov. 19.
Amalgamated Copper	86½	84⅞
American Smelting & Refining Co	96	95
Boston Copper	17¾	16⅛
Butte Coalition	27⅞	26⅞
Cumberland Ely	8¼	8½
Dolores	7½	7½
El Rayo	4¼	4
Giroux	4⅜	4½
Greene-Cananea	11⅞	11⅛
Indiana Sonora	4⅞	4¾
La Rose	6 15/16	7
Miami Copper	12⅞	13⅜
Nevada Consolidated	19⅞	18⅞
Newhouse	6¼	6½
Nipissing	11	11⅛
Ohio Copper	4½	5⅛
Tennessee Copper	48⅞	50⅛
Utah Copper	50¾	47
Yukon	4¼	4⅜

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, November 19.

Atlanta	$ 24	Laguna	$ 1.25
Belmont	1.12	MacNamara	52
Booth	34	Manhattan Con	6
Columbia Mtn	17	Midway	27
Combination Fraction	1.47	Montana Tonopah	80
Daisy	99	Nevada Hills	1.50
Fairview Eagle	25	Rawhide Queen	65
Florence	4.47	Sandstorm	22
Gold Bar (Bullfrog)	3	Silver Pick	12
Goldfield Con	6.90	St. Ives	25
Gold Kewenas	27	Tonopah Extension	55
Great Bend	35	Tonopah of Nevada	7.00
Jim Butler	22	Tramp Con	16
Jumbo Extension	32	West End	45

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. November 19.		Closing prices. November 19.
Adventure	8¼	Mohawk	——
Ahmeek	120	Nevada Con	18¾
Allouez	38	North Butte	87
Amalgamated	84⅞	Old Dominion	57½
Arcadian	4¾	Osceola	122
Atlantic	18	Parrot	27¾
Boston Con	16½	Quincy	96½
Butte Coalition	26¾	Rhode Island	5¼
Calumet & Arizona	119½	Santa Fe	3⅛
Calumet & Hecla	685	Shannon	18
Centennial	34	Superior & Pittsburg	18⅜
Copper Range	81	Tamarack	82½
Daly-West	10	Trinity	18
Franklin	16¼	United Copper Con	14½
Granby	107	Utah Copper	46¾
Greene-Cananea, ctf	11⅛	Victoria	4¾
Isle Royale	23	Winona	6¼
Mass	7	Wolverine	150

General Mining News.

ARIZONA.

COCHISE COUNTY.

Walker & Meyers have bonded their Black Queen group of 11 claims to F. S. Hayward and Herbert Hausman, who have already started a force of three men at work in crosscut from an adit on the Black Queen claim. No cash payment was made and none is due until 11 months from the date of the contract. The group is one and a half miles east of Paradise.——Miners bring the news of a new gold excitement near Gleason, which has aroused much interest and caused quite a rush to the new fields. Some rich samples of free gold were found, and further work has

Southeastern Arizona.

encouraged the belief that a rich goldfield has been found. The country is all located by the prospectors and miners who were attracted from Gleason, Leadville, and Courtland, and it is thought development will open up a bonanza. ——The Warren mine near Bisbee has shut down, probably because of lack of funds to carry on the work, although some rumors have it that excessive water was the cause.

MARICOPA COUNTY.

(Special Correspondence).—Indications point to much mining activity in the long neglected White Tanks district, 35 miles west of Phoenix,. during the coming winter. At this time the largest force of miners in the district is at the Union property. This mine is developed with several vertical shafts, the main one of which is 230 ft. deep, with levels run out upon the vein at intervals of 50 ft. to the extent of about 250 ft., making almost 500 ft. of development work in this shaft alone. The work is in ore all the way down and all the drifts are in ore of a milling grade. The vein averages about 20 ft. wide between walls, and the pay streak varies from 3 to 8 ft. wide. The main vein is a true fissure in granite, the fissure being filled with diorite and porphyry dikes, which act as a hanging wall for the gold quartz vein, which carries the ore. There are several other mines and prospects in the vicinity of the Union mine whose ore averages over $18 per ton. The Black Hawk Co.'s property, one-half mile west, is developed with a shaft 80 ft. deep, the ore of which milled $18 per ton. There is also the National mine, one mile northwest, which is producing ore that mills $16 per ton. There are several other gold prospects in the district being operated by the owners without the employment of outside labor. The district is in the gold belt that runs northeast to Fair Peaks and southwest to the Vulture mine at Wickenburg. Plans are being made by the owners of at least two of the properties above named to install steam hoisting plants, and, if possible, to erect a mill for the reduction and treatment of all the ores in the camp. In the latter enterprise outside capital will be asked. The ores of the camp are a thoroughly oxidized quartz, and the gold is absolutely free-milling.

Phoenix, November 14.

MOHAVE COUNTY.

A strike of rich ore was made last week on the 700-ft. level of the Billy Bryan mine in the Gold Road group. The shaft has been going down for the last six months, but now a station is being cut and a level will be started at this point. A drift being driven from the 500-ft. point of the Gold Road shaft to strike the Billy Bryan has only 100 ft. farther to go.——A station is being cut at the 500-ft. level of the Golden Gem shaft, at Cerbat. Drifts are to be run in several directions and it is expected that good orebodies will be developed.

YAVAPAI COUNTY.

(Special Correspondence).—The properties of the Consolidated Arizona Smelting Co., bankrupt, consisting of a complete smelting plant at Humboldt; a number of valuable mining claims; stocks and bonds were sold today at public auction by the trustee in bankruptcy, J. Kearney Rice. The price accepted aggregates about $460,000, of which amount $200,000 is cash, and the purchasers agree to take over mortgages to the amount of about $260,000. The purchasers are Edwin S. Hooley and Thomas Achenbach, of New York, there being only one other bid, that offered by J. Thomas Reinhardt, which was $5000 less than the bid finally accepted. When the sale was announced, the purchasers immediately paid to the trustee in bankruptcy 10% of the purchase price. It seems that there are a number of unsatisfied claims against the bankrupt company, and it is probable that these will have to be adjusted in the courts. It is to be hoped, however, that all claims will be speedily settled and the smelter started, as it means much to this county, where so many mines are producing in a small way, but cannot erect their own smelters, or ship their ores to far-away smelters for treatment.

Prescott, November 10.

YUMA COUNTY.

Reports from the Quartzsite district are to the effect that the Colonial mine, which is a quicksilver proposition, will employ about 40 men. The New Fork Formosa mine is installing the largest crushing and gold-milling plant in that district. A pipe-line is to be constructed from Quartzsite to the mines, a distance of nine miles. The Success mine is shipping ore. The last carload netted $2300 and the promoters are much encouraged.

CALIFORNIA.

INYO COUNTY.

(Special Correspondence).—The shaft at the Cerro Gordo has been sent down to the 1100-ft. level and a body of rich silver ore has been cut at that point. During the summer a large quantity of ore was developed in the upper

workings. Levels have been cut at the 90, 192, 400, 700, 800, 900, and 1000-ft. points with considerable driving at each level. The shaft is near the summit of Cerro Gordo peak, at an approximate elevation of 8500 ft. above the sea. The two veins are fissure contacts containing silver, lead, and zinc. To transport the ore from the mine to the smelter, at Keeler, a 200-ton aerial tramway was recently completed. The Keeler smelter comprises one furnace with a capacity of 150 tons per day. The company also owns excellent water rights at Lone Pine and is erecting an electric power plant at that point. E. O. McGrath is general manager.——The Tecopa Mining Co. is shipping about 50 tons of lead ore to the Salt Lake smelters and expects to increase the output about the first of the year. The Gunsight vein was recently recovered on the 600-ft. level. At both the Gunsight and Noonsday shafts much development work is going on with satisfactory results. About 75 men are employed. The management is planning to erect a large concentrating plant early in 1909. Under present conditions the ore is hauled by mule-teams to the Tecopa siding on the T. & T. railroad. J. H. Lester is manager.——The shaft at the Bishop Creek mine is going down steadily on a vein that assays about $150 per ton. The property is capitalized at $25,000,000, a circumstance that has invited much criticism. To pay dividends this property must naturally develop into a stupendous producer, and at the present time it is little more than a prospect. Gaylord Wilshire, editor of *Wilshire's Magazine* and a noted Socialist leader, is at the head of the enterprise. Associated with him are a number of American and English Socialists. The mine is at an altitude of about 9000 ft. and during the winter season all work must necessarily be performed under shelter. Prospecting has been done with diamond-drills and several bodies of fair-grade ore struck at a depth of several hundred feet. The shaft is being sunk as a result of these borings. Water-power for all purposes is available.—— Some rich ore has been struck in the bottom of a 40-ft. shaft at the Black canyon. A large quantity of milling ore, which assays $10 to $20 per ton, has been developed in the mine. Local people are interested.——The Southern Belle mill is running on ore from near the 325-ft. level of the Bullion shaft. Extensive developments planned by this company for the past summer were indefinitely postponed owing to the financial depression. San Francisco people are interested.——The 10-stamp mill at the Skidoo mine is reported to be turning out about $10,000 per month, with considerable development work going on in the mine. ——The Killian M. Co. is sinking a shaft at its property near Fohrman and erecting buildings and cottages. Fifteen men are employed.

Bishop, November 6.

NEVADA COUNTY.

(Special Correspondence).—Thirty stamps are dropping at the Empire and before the end of the month it is expected to have the full mill running. Nearly all the men have gone back to work on full time. The water situation has improved during the past few weeks. George W. Starr is manager.——A 2½-ft. vein of high-grade ore has been struck on the 1400-ft. level of the Pennsylvania mine. Bennett Opie is superintendent.——The North Star Mines Co. is constructing a pipe-line to connect the air-blower at Larimer's dam with the Central cyanide plant.——A rich streak of quartz has been opened on the Beth vein at the Yellow Metal mine. Al Keller and Alex McMillin are developing the property.——R. M. Wilson, representing Goldfield capital, is inspecting properties at Grass Valley.—— The St. Gothard G. M. Co., operating the Delhi mine at Columbia hill, has declared dividend No. 4 of five cents per share. The amount is $5000. Active developments are being pushed with excellent results.——The Oustomah and Murchie mines have resumed operations.——It is understood that an offer of $400,000 has been made for the Champion mines, but that it was declined by the owners.

Grass Valley, November 16.

PLUMAS COUNTY.

A strike of $30 ore has been made in the Gruss mine near Genesee. A body of $10 ore, four feet wide, has also been opened at another place. It is said that machine drills and compressors will be put in.——The old Crescent mine, near Crescent Mills, is to be re-opened by the heirs of James McDonald. The property has been idle for a number of years because the ownership was invested in an estate.

SHASTA COUNTY.

The case of the United States *v.* the Mountain Copper Co., of California, brought by the Government to obtain an injunction against the Company, prohibiting it from operating the smelter at Keswick, because of the injurious effects of the fumes to adjacent timber lands, was dismissed last week in the Supreme Court, as the result of a stipulation between the Government and the Company. The terms of the stipulation are believed to be that the Company will pay damages done to Government timber, which, by the way, it has always been willing to do.

SIERRA COUNTY.

Robert H. Duriee, who was operating at Poker Flat, has ceased operations for the winter and gone to San Francisco. Mr. Duriee expects to return early in the spring and continue development work on his vein.——Jason Frye and associates have taken a bond on the Cruttenden claim in Sailor ravine and will soon start two shifts at work. They plan to drive an adit to strike the vein and then follow the streak to a point under the shaft, where it is believed a good orebody will be cut.——Work has been resumed in the Corotoma mine in Forest after a short shutdown. Two shifts are at work in the main adit.

TRINITY COUNTY.

C. B. Rick has recently purchased the Maple Creek placer mine on Dutch creek. Eleven men are now employed repairing the flumes and preparing bedrock ditches. In about three weeks the mine will be in first-class shape for the coming season. It is reported large quantities of platinum are found in the black sand, and special undercurrents are being installed for the purpose of saving that valuable mineral.

TUOLUMNE COUNTY.

The Imperial group of mines, containing seven claims, at Jacksonville, have been bonded by Charles A. Fitzgerald to the Imperial Co. for $25,000, final payment to be made before January 1910.——John Voss has given an option to purchase at $2500 on his placer property, at Yankee hill, to E. R. McLeod, of Portland, Oregon. Mr. McLeod agrees to furnish hydraulicking machinery and test the gravel.——The shaft at the Ralph mine is now 200 ft. deep and 16 men are employed in sinking still deeper. It is reported that four good veins have been cut by the Bagdad Chase Co.——An air-compressor and power-drills are being installed at the Riverside, above Columbia.——A carload of machinery for the Ethel, two miles east of Columbia, arrived in Sonora last week.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—A two-foot vein of 200-oz. silver ore has been opened in the drift from the La Plata adit of the White Metal property on Democrat Mtn. In addition, a 4-in. streak, which assays 1000 oz., is exposed the full length of the drift. This property is being operated under lease by Broad & Woodrow.——In the Daily district there is much activity. On Wood Mtn., the Wood Creek & Williams Fork M. M. T. & D. Co. is employing a force of eight men in the driving of the adit for the intersecting of the series of 78 veins controlled. The bore is nearing the 400-ft. point, three veins having been intersected, but no driving will be done until greater depth is attained. T. Tyler, who is manager, recently sent in supplies to last through the winter months.——Bill Young, the father of the district and owner of the Puzzler mine, is carrying on an energetic campaign of development. During the summer months regular shipments were sent out, the product being shipped direct to the Argo smelter. Returns averaging

$200 per ton were received in gold and silver, with the former predominating. The lower cross-cut recently intersected the Puzzler vein and a streak of ore was exposed that is 10 in. wide. Driving is now in progress.——G. Dalgleisch is driving the Scotia adit and occasional bunches of ore are found which show gold and silver content as high as $900 per ton. A cross-vein will be intersected within a few feet.——E. M. Moscript, manager of the Butler mine, is employing a force of men in the development work. A streak of medium-grade ore is being followed but pending the completion of the concentrating plant, now in the course of construction, only dead work is being done. The mill will probably be completed inside of 60 days.——Nels Anderson, leasing on the Seven-Thirty, has made a shipment of five tons that milled 587 oz. silver and 20% lead. This operator has the best paying lease in the district, and during the last three months has been netting from $8000 to $10,000 per month after paying cost of transportation, smelting, and royalty.——Another shipment of 100 tons of silver-lead-zinc ore was started this week from the Gambetta, Republican Mtn. The ore is being sent to the Linn mill for concentration in order to avoid the penalty on zinc. B. J. O'Connell, who is manager, sent to the sampler 20 tons of zinc ore, which will run nearly 75%. It is the intention of those interested in the property to shortly start another adit, the portal of which will be farther down the hill. With depth the ore-shoots of this locality carry a heavier percentage of lead and iron, zinc very seldom being found.——Within two weeks a big campaign of development will be put under way upon the Smuggler, Brown Mtn. A new company is now being organized, the property having been purchased from the estate of B. C. Catren for a consideration of $80,000. In addition to the running of the drifts east and west on the five levels, the shaft is to be deepened 150 ft.——Advices received from New York by B. C. Catren, Jr., the first of the week, instructed him to proceed at once with the development of the Terrible mine. Accordingly a force of 20 men was put to work, but within another two weeks the force will be doubled. It is the intention of the Whiting M. & M. Co. to clean out levels 11, 12, 13, and 14, and to run drifts both east and west. Funds have been provided for the carrying of the proposed work to a successful issue.——B. C. Catren, Jr., has now in process of organization a company which has secured a lease on a large block of ground on the Terrible. Operations will be started on the fourteenth level and a winze is to be sunk for 100 ft., after which driving will be started.——Louis Just, who is leasing on the upper Frostberg, made a 10-ton shipment of first-class ore this week that brought a settlement of 340 oz. silver and 27% zinc.——At a recent meeting held in Denver of the Centurion M. Co. and the Champion Comstock M. Co. the board of directors resigned and new ones were elected. It was then voted to effect a consolidation with the Banner Con. M. Co., which will hereafter manage and direct the affairs of the two companies. The two first mentioned groups consist of 25 patented and 5 unpatented claims, situated up Trail Run. Within 30 days work will be resumed upon the Centurion, as there is a large amount of unexploited territory above the level of the Centurion adit, as well as on other parts of the property.——Work has been resumed upon the holdings of the Southern M. M. & D. Co., West Argentine. The Robert E. Lee adit is being driven ahead and a vein will be reached within from 20 to 25 ft. F. Babcock is manager.

Georgetown, November 14.

GILPIN COUNTY.

Denver people are associated with Joseph Espel, of Central City, in the opening of the National and Topsy properties on Michigan hill, in the Pine Creek district. Work is being centred in the National adit, which is now in a distance of 75 ft. Some extra hard rock is being encountered. ——Sinking operations have been suspended at the Bench mine, in Russell district, operated by the Aztec Mines Co., at a depth of 200 ft., and now drifts are being extended east and west at that depth. The latter work is being done under contract and good headway is being made. There is about three feet of vein matter in sight and H. Irving Jones, the manager, expects to get under the ore-shoot at an early date.——The Ralls County mine, on Quartz hill, has been started up during the past week under a lease and bond by John F. Shaw and associates of Brookville, Pa. There is a good plant of machinery on the property, and active developments are being outlined by the lessees. The property has been worked steadily for a number of years past, both by the owner, Charles Gage, as well as by lessees.——The German mine on Quartz hill has been leased and bonded by William Knutson, of Philadelphia, Pennsylvania, from Bishop Matz, of Denver, under an agreement for two years in the sum of $10,000. Some work has already been done in putting the shaft in good shape and drifts are being extended at a depth of 150 ft. This is the present bottom of the shaft, as it is filled in below that depth, although the shaft is reported to be over 600 ft. deep. The lessee has uncovered some uranium ores and has taken hold of the property with the express purpose of developing the uranium orebody. Development work will be carried on and if the indications warrant it the lessee will install a large and powerful plant of machinery within the near future.——A plant of machinery is to be installed on the Great Mammoth mine, in the Illinois Central district, by Gordon & Co., who have taken the property under a lease and bond from John Best, of Denver. The lessees report having opened up a good body of ore which they can mine with greatly reduced costs.

SAN JUAN COUNTY.

The Animas Power Co. has made connection with the plant of the Telescope Mining Co., in Mill gulch, and the machinery will be started at once. At first one shift only will be employed. H. A. Miller is manager.——The management of the Champion is asking for bids for an 850-ft. adit, to be started at the base of the mountain.——A. L. Klinger, who is working the Blackstone in Prospect gulch, near the Henrietta, has lately struck an 18-in. streak of lead carbonate. The orebody was found in driving from the bottom of the shaft, through which the mine was worked more than 20 years ago.

TELLER COUNTY.

The Accident Leasing Co., whose promoters and shareholders purchased the Morrel & Bombee lease on the Accident mine on the southwestern slope of Gold hill, at Cripple Creek, commenced hoisting ore last week and will make its initial shipment soon. The leasing company is operating from the bottom of a winze sunk to a depth of 100 ft. below the 280-ft. level, and for the present the ore is hoisted by windlass and then trammed out to the shaft. The management will shortly install a hoist over the winze.——A new lease on the Laura Lee claim on Mineral hill, covering a period of two years from date has been secured by Ellis F. Britton, of Cripple Creek, from the owners, F. J. Campbell and G. S. Wood, of Denver. The shaft, already sunk to a depth of 130 ft., is to be carried down an additional 200 ft. with the least possible delay, and a powerful plant of machinery will soon replace the horse-whim now in use. Two heavily mineralized dikes have already been exposed by surface workings on the Laura Lee, and rich quartz containing native gold has been a common occurrence along these intrusions.——The suit between the Jennie Sample G. M. Co. and Mrs. J. J. Cone, in which the former sought to recover damages for alleged illegal extraction of ore from the Ophir mine, has been settled out of court by the payment of the Jennie Sample company of $20,000 and the granting to it of the right to use the north and west shafts of the mine for a period of five years.——By agreement entered into between the Peoples M. M. Co. and William Fulton, trustee in bankruptcy of the Central Consolidated Mines corporation, the first named corporation, in consideration of $1000, agrees to release all claims to the two acres in conflict between the Gold Leaf lode and the Happy Year and Josephine lode mining claims owned by the Central Consolidated company. The properties are on the northwestern slope of Raven hill.

IDAHO.

KOOTENAI COUNTY.

Uranium has been discovered on the property of the Green Mountain G. M. & M. Co., near Tyson. The ore was discovered in tunnel No. 3 more than a year ago, but as it showed only traces of copper and gold, and no other metals, it was thrown on the dump, where it remained until a miner from the Black Hills recognized it. Assays show the ore carries 3.7% uranium, and is worth $130 per ton. The ore was found in a four-foot vein running 12 ft. south of, and parallel to, the main gold-bearing vein, which has been under development several years. It occurs in two forms, a dark-green glossy ore, light in weight, and also a pitchblende, black and heavy. John A. Johnson, Jr., and associates, of Spokane, are interested.

SHOSHONE COUNTY.

(Special Correspondence).—Still a third suit has been hurled at the Bunker Hill & Sullivan Mining & Concentrating Co. This is at the instance of the January Mining Co., and is for no less than full possesion of the great Wardner lead-silver vein, and for a full accounting for all mineral-bearing rock or ore taken from the vein. The January Mining Co. is a corporation organized under the laws of the State of Oregon and with its head office at Portland, in that State. It claims to be the owner of the Republican Fraction claim, in the Yreka mining district, by virtue of a series of transfers through which the claim in question passed from the possession of the Federal company to that company's attorney, Frank T. Post, of Spokane, and from him to the January company. On account of these transfers it is the general belief that the Federal company is in reality behind the suit, the winning of which would probably give them the control of the world's lead market. It is alleged in the complaint that the Wardner vein traverses the Republican Fraction claim in an easterly and westerly direction, and that on its course the apex of the vein crosses the end lines of the claim. The downward course of the vein is said to be southerly and on this course passes out of and extends indefinitely beyond a vertical plane drawn through a southerly boundary line. It is also alleged that this vein is the same as that which outcrops within the Bunker Hill, Stemwinder, Last Chance, Emma, and Tyler claims and which is generally known as the Wardner vein or lode. The January company claims to be entitled to the possession of all of the vein throughout its entire length, including that part of it which extends through the claims named. The Bunker Hill company is accused of having converted to its own use the ore contained in this vein, but to what extent has not been ascertained. It is also alleged that the defendant company is so working within the vein as to destroy the evidence of the value of the ore which it has extracted by filling the voids created with debris and waste. The January company petitions for judgments of $7,300,000, the reputed value of the ore taken from the vein since November 15, 1905; that its title to the Republican Fraction claim and the whole of the Wardner vein be quieted; that the Bunker Hill company be made to account for all mineral-bearing rock or ore extracted from the vein; for the costs of the action; and for general relief. Gray & Knight, of Wallace, and Frank T. Post, of Spokane, are attorneys for the plaintiff company.——One of the most important developments in connection with the mining industry of the Coeur d'Alene is the proposition by a number of the biggest owners in the Murray district to develop their properties by means of one long adit and a jointly owned mill at the portal. This project has been mooted for some time past, but steps are being taken at present to bring the proposition down to a business basis. Those who are thoroughly intimate with these plans state that the result will either be the operation of an adit and a mill as stated, or else the formation of one merger including five, at least, of the best mines in the district. From preliminary surveys it is estimated that the adit will be about 7000 ft. long and cost approximately $100,000. If built it will develop a total of 61 claims belonging to the following mines: Jewell, Chicago-London, Black Horse, Paragon, and Bear Top. The portal will be at the Jewell mine, which is on the line of the Idaho-Northern railroad and offers exceptionally good facilities in the way of mill-sites.——A splendid impetus to the industry of the whole district has been given by the announcement of the Snowstorm Mining Co. of another dividend of $45,000 for the month of November. Accompanying this dividend is a statement of the management that dividends will be continued at the same rate throughout the year. The Company has now disbursed over $1,000,000 in dividends, of which $90,000 has been paid this year.——The big 11-ton transformer for the Washington Water Power Co. has at last been delivered at the Company's sub-station at Wardner and will be installed for the use of the Federal company in the working of the Last Chance mine, replacing the two smaller transformers used in the past.——An important decision in favor of the mining companies of the Coeur d'Alene has been rendered by the United States Court of Appeals, at San Francisco, in connection with the suit of Timothy McCarthy, Elmer Doty, and William Raney, on behalf of the ranchers in the Coeur d'Alene valley against the Bunker Hill & Sullivan Mining Co., the Federal Mining & Smelting Co., the Gold Hunter M. & S. Co., and Larson & Greenough. The suit was for a perpetual injunction against the mining companies and was based on the claim that by reason of the water of the Coeur d'Alene river being used for mining purposes it was rendered unfit for irrigation. Forty-five different ranches were represented in the suit and the decision was quite a blow to them.——Steps are being taken to relieve the Rex Mining Co. from the litigation which has hampered the development for several months and under which shipments from the mine were made under supervision of the Court. The mine is a steady producer and is equipped with a 100-ton mill.——Everything is now in readiness for starting the long adit in the Copper King mine. The new compressor has been installed and all the recently ordered equipment delivered at the mine. The arrangement of the buildings in this property is said to be the best of any mine in the district, all being connected under one roof. The adit in which work is about to start will cost in the neighborhood of $45,000 and will give a depth of almost 1000 ft. more than the existing lower workings.——At a meeting of the stockholders of the Missoula Copper Co. it was decided to levy an assessment of three mills per share on the capital stock, for the purpose of providing funds with which to further exploit the property by diamond drilling. The secretary-treasurer's report of work for the last year showed that $31,479 had been expended and that but little more than $1000 remained in the treasury.——The lessees of the property of the Idora Mining Co., in the Sunset Peak district, have commenced the shipment of ore to the Panhandle smelter, at Sandpoint. The first shipment consisted of 40 tons and others will follow at regular intervals.——A new hoist and pump are to be installed in the property of the Gold Ridge Mining Co., in the St. Joe district. The shaft has been sunk to a depth of 180 ft. and some ore assaying $65 per ton has been found.

Wallace, November 14.

NEVADA.

CHURCHILL COUNTY.

Charles Lamb and James R. Keir are planning to continue work all winter on their properties in the Wonder district. They have recently sent a stock of supplies in from Fallon.——The June Wonder is to let a contract for sinking an additional 50 ft. in its shaft.——E. A. Ferron and Harry Grigsby have recently taken a contract for some additional work on the Vulture Extension property.

ESMERALDA COUNTY.

The Goldfield-Boston Mining Co. will resume work on its group in the eastern part of the Goldfield district, and D. W. McFadden has arrived to manage affairs.——The management of the Mushett lease has been compelled to sus-

pend operations because of a lack of funds to meet the payrolls.——Having outlived its usefulness, the Kinkead mill has been closed. For the past several months it has been used to treat Combination mill concentrate by the Hutchinson process. This process will be used at the new Consolidated mill, and until such time as the new plant is in readiness, the concentrate from the Combination mill will be allowed to accumulate.——A meeting of the shareholders in the Washington-Nevada Mining Co. was held last week in Goldfield and it was decided to sink a shaft to a depth of 100 ft. on one of the claims of the Company east of Lida. C. H. Beesley has been elected president; N. B. Bertram, L. E. Campbell, Robert Lanka, and Louis Sweitzer are additional directors.

HUMBOLDT COUNTY.

The merger recently reported as consummated between the Seven Troughs, Therien, Kindergarten, and Red Cloud properties is now a fact, and on this merger is based the Seven Troughs Coalition Mines Co. The new Company will add to its holdings some of the other prominent mines of the camp.——G. C. Richards, of Berkeley, California, has been looking over the mining situation at Vernon, in view of the installation of a custom mill at that point.

LINCOLN COUNTY.

Operations are to be started at once by the Searchlight-Spokane M. & M. Co. on its property at Searchlight. The

Little Valley, Near Carson City.

main shaft will be enlarged and then sinking below the 200-ft. level will be undertaken. Pending the installation of a pumping plant, an unexplored portion of the mine to the west below the second level will probably be developed. A. M. Jennings is president.——J. G. Thornburgh, of Colorado, has taken a two years' lease and bond on the Red Bird group, three miles east of Searchlight. By the terms of the contract work must be started by December 1.——H. J. Myers, of Detroit, Michigan, is reported to be interested in a project to build a number of dredges on the Colorado river near Eldorado canyon.

NYE COUNTY.

Three carloads of machinery for the Jefferson mine, near Round Mountain, have arrived at Battle Mountain, from where it will be hauled by wagon. W. H. McBeth has recently purchased the Jefferson and expects to develop a dividend payer.——It is expected that the custom mill at Springdale will be in operation some time in January.——J. V. Priest, manager of the Mogul mining group in the Ray district, ten miles north of Tonopah, expects to leave soon for the East to interest capital in the group of 80 claims owned by his company.——The first clean-up of the Goldfield Blue Bell Mining Co. was made last week at its mill on the Stokes property at Berlin. The clean-up amounted to $15,000 and was entirely from ore in the bins and on the dump. The ore ran a little more than $10 per ton. Only 20 of the 30 stamps are in use.——The Tonopah & Goldfield Railroad Co. has decided to transform all their coal-burning engines into oil burners.——The mines of Tonopah produced during the week ending November 14 a total of 5393 tons of an estimated value of $134,825.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Lucille Dreyfus mine, near Danville, is producing richer ore than usual, and some of it contains copper. The compnay will soon begin shipping. A larger force will be employed, when the winze below the adit level will be sunk 100 ft. deeper.——The Keller & Indiana S. & D. Co. is employing ten 4-horse teams hauling ore from the Manilla mine to the smelter at the rate of 35 tons per day. Over 200 tons have been hauled. Charles Young, formerly of Cedar Canyon, Stevens county, has succeeded Spence Smith as superintendent of the Manilla mine.——A rich strike was made a few weeks ago while cutting out a station on the 300-ft. level of the Leonett mine, on Meadow creek, three miles northwest of Keller. A winze will be sunk at the station. The property is now under bond to Seattle people, who will push development work during the coming winter.——G. Weaver Loper, general manager for the Colville M. & S. Co. has returned to New York, after bonding the Independence group of claims, at Park City. The purchase will add five valuable claims to his former purchases. The consideration is stated at $24,000, of which $2000 is cash, the remainder is to be paid in ten months. The tightness of the money market retarded work on the smelter under construction by the Colville M. & S. Co., but work on it is now being rushed.——Recently the Longstreet and R. E. Lee claims in the Enterprise district were bonded to the Dan Patch M. & D. Co., of Spokane, composed of Couer d'Alene men. The Longstreet is traversed by a porphyry dike, about 100 ft. wide, which carries silver in payable quantities. Some of the ore is very rich. On the R. E. Lee a porphyry dike, about 200 ft. wide, parallels the other and is traversed by a vein of porphyritic quartz, through which streaks of antimonial ore, some of it solid stibnite, run from two to four feet wide. The R. E. Lee is opened by shaft work and 500 ft. of adit on the vein. The Longstreet is opened by shafts, other surface work and an adit, 200 ft. long, cross-cutting the porphyry dike.——The Silver Leaf mine, under active operation, is situated on Rattlesnake Mtn., one-fourth mile east of the Longstreet. It is under bond to Seattle people. It has an outcrop about 50 ft. wide. At a depth of 75 ft. this vein has been intersected and an adit follows it about 200 ft. These, with considerable surface work serve to show up a fine-looking property. There are about 100 tons of ore on the adit dump. Should the bonds on these properties be taken up, considerable activity is promised, and both Meteor and Covada camps will doubtless become lively. Among the principal mines of the Enterprise district, owned by incorporated companies are the Meteor, Stray Dog (the latter lately passed into new hands, after a long period of internal strife and litigation), Syndicate, Advance, Keystone, Blackthorne, Orion, Southern Cross, Blue Grouse, Perry, Nonpariel, Etta, New York, Cold Spring, and White Swan groups, all having contact veins, mainly between granite and porphyry formations. The Silver Leaf vein lies between granite and limestone, the latter forming the hanging wall. The Stray Dog is a valuable mine, showing gold, silver, copper, and lead ores. The vein crosses Stray Dog canyon, and a group of claims, with a vein running parallel to it, is owned and operated by George Turpening, who is driving a cross-cut adit to tap the vein 150 ft. deep. This group is called the Imperial.

Republic, November 14.

SKAGITT COUNTY.

The Skagit Queen, at Marblemount, is being developed and equipped under the superintendency of C. D. Grove, who has a force of 35 men. An adit is being driven with air-drills to open the orebody, which carries chloride and bromide of silver, with some gold and copper, in a quartz gangue. A 1500-ft. pipe-line, extending from a point above a dam on Thunder creek to the power plant, gives a 550-ft. head of water. The power plant, when finished according to present plans, will consist of two air-compressors, driven by Pelton wheels. A dynamo will be operated also to generate electric light for the camp.

Special Correspondence.

DAWSON, YUKON.

Close of Season.—Yukon Ditch.—Dredging on Forty-Mile.—Successful Operations.—On the Stewart.— Creek Diggings. — Cheerful Prospects for Next Summer.

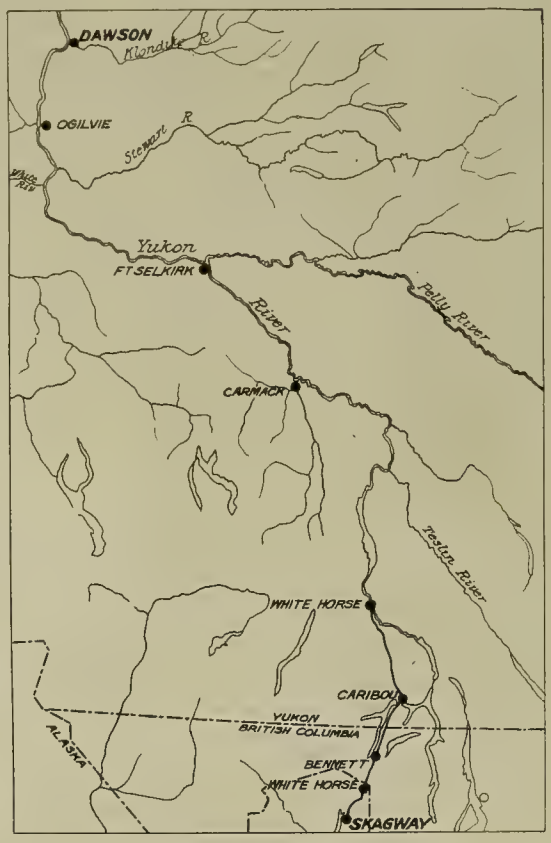
This winter in Dawson came suddenly, sooner, and with more severity than usual. We were taken unawares and consequently unprepared, being obliged in some instances to use hot water to thaw out our frozen sluice-boxes in order to make the final clean-up. Of course, the usual perversity obtained in small things, such as needed parts of machinery that were delayed at White Horse or points farther south, etc.; nevertheless, on the whole, the season has been satisfactory. The output this year will probably exceed $3,500,000, an increase of more than a million over last season. This increase is due to the improved methods of working the low-grade gravel by the use of dredges, mechanical elevators, aided by hydro-electric power. These are the improvements lately installed by the Yukon Gold Co., and consequently they are in a great measure responsible for the increase in our gold output. This company has done a great deal of work this summer, employing at times as many as 2500 men, who have been well housed and cared for—no small undertaking in itself, in this country of big distances and difficult transportation. The greater part of this force has been employed on the big ditch. This ditch, with its connecting pipe-lines, in the form of inverted siphons, spanning the intervening gulches and valleys, is finished, and water could have been turned on this fall, but it was thought best not to soak the bottom of a new ditch just before the freeze-up, because this would have left it in bad condition for early use in the spring. The water will be turned on for the first time next year; then great things are expected, as the hillsides and benches on Bonanza creek, where this water is to be used, are rich. It is expected that this ditch will deliver 5000 inches of water. A particularly fine piece of work in connection with this ditch was the last connecting link in the system; it was the siphon across the Klondike valley at a point opposite Bear creek. It is 44 in. diam. at the lowest point, which is 1100 ft. below the intake, and approximately three miles long; and is probably the largest of its kind. The other siphons belonging to this system are equally good, but do not impress one so much, possibly because they are not nearly so long. At the point of greatest pressure, the pipe is ⅝-in. thick, lap-welded, and solidly riveted; as the pressure decreases on both sides the thickness of iron is less, accordingly. Wooden pipe is used at both ends until a point is reached where the pressure exceeds 65 lb. per square inch. The whole is firmly secured on substantial tressle work of native timber, and is very strong. C. G. Newton has been in immediate charge of this work.

Four new dredges have been put to work this season by the same Company, with gratifying results. They all have 7-ft. buckets, two being Marion, and two Bucyrus boats. One of these machines was started on 90 Below on Bonanza, recovering, it is said, 60 cents per cubic yard net, and digging 3750 cu. yd. of gravel and bedrock each 24 hr. Another equally good boat was put to work on 35 Below on Hunker creek; returns from this machine have never become known, but we do know that the ground at this point is rich, so no doubt the result was good. The third boat started to work on the upper end of the Anderson Concession late in the season; several clean-ups were made; these were large, but the exact amount could not be obtained; it is safe to say that they exceeded $10,000 for each run of from two to three days. The fourth, and also the last boat to start, was built at the mouth of Hunker creek, but got to work so late that she could do nothing more than dig herself into secure winter quarters. All of these boats should give a good account next year.

The mechanical elevator designed by O. B. Perry demonstrated that it is the most effective piece of machinery yet devised for the recovery of gold in creek-bottoms where it is impossible to work dredges, either on account of heavy bedrock, its depth, its narrowness, or for various other reasons.

The Walker's Fork Gold Dredging Co., of London, started their new dredge to work about the middle of June; this boat was built by the Risdon Iron Works, of San Francisco, and is equipped with a 5-ft. open-connected bucket line, and is of latest Risdon design all through. It is run by steam, as there is no electric power to be had in this district. This boat is now in charge of Robert Milvain, who represents this company in the North.

Many obstacles made it impossible to get down to work until the latter part of the season, but as the ground moved yielded nearly a dollar per yard, there was no disappointment in camp, as it was felt that all difficulties would soon be overcome. Russell King, of London, is president of this company. The Consolidated Gold Dredging Co. of Alaska,



Part of the Yukon Territory, Canada.

with headquarters at Chicago, and local offices in Dawson, is developing a dredging field of great promise on the Forty-Mile river; they control about 40 miles of the river bed, and now have a 7-ft. open-connected Allis-Chalmers dredge at work, at a point 7 miles up-stream from the mouth of the river. This boat is working in the river, the gravel being in almost every case submerged; a cut 200 ft. wide is taken, the gravel varying in depth from one or two feet above bedrock to as much as 16 ft. The gold lies chiefly on, and in, bedrock; it is necessary to dig at least four feet of it to be sure that the extraction is complete. As the bedrock so far has been soft schist, no trouble has been found in digging to this depth. It is understood that the company is making money with this machine, as at the present time the boat is digging through the Sour Dough bar, which was one of the spots that could always be depended upon to furnish a grubstake in the days before Dawson was even thought of. They have also a smaller dredge, which was assembled in Dawson the ma-

chinery only being supplied by the Risdon Iron Works. This boat is not of much value as a producer, being too small, and not strong enough; it is, however, valuable as a prospector, and in this capacity has given satisfaction. The method is to dredge a couple of thousand yards here and there, in a general up-stream direction, cleaning up at every point, and determining the value of the gravel at each particular place. This will appeal to all practical men as a splendid way to prospect such a property; the expense is light, as the production about meets the cost of moving the dredge. Moving is accomplished by the use of a capstan securely fastened on the bow of the dredge, by which the boat is gradually pulled with the aid of wire cables firmly planted on the bank at some point up-stream. S. E. Bliss, of Chicago, is president of this company, the office being in the Monadnock Bdg. F. E. Davison is manager and has his office at Dawson; his brother, A. E. Davison, is assistant manager, with his office at the dredge. C. W. Moore is foreman.

The Gold Scoopers Dredging Co.'s machine on Walker's Fork has had a fairly satisfactory season. It is generally understood that the company is pleased with the result of operations, as compared with the disappointment of last season, when this boat did practically nothing. The machine is a 5-ft. open-connected Risdon dredge, run by steam-power. Its capacity is estimated at 2500 cu. yd. per day of 24 hr.; this has never been attained, 1500 cu. yd. being the limit, due partly to shallowness of the ground (7 ft.), which necessitates frequent moving of lines. Russell King is also president of this company, and J. Gordon MacLaren is the company's representative in the North. There is some talk of the two companies of which Mr. King is president establishing next year a hydro-electric plant at a point on Walker's Fork that will be midway between the two properties, using the waters of this creek and also of Liberty creek, a tributary of the Walker's Fork. This property is on the American side, about 4 miles west of the boundary, which is now being established by a joint party of Canadian and American engineers.

The North American Transportation & Trading Co. has a most valuable property on Miller creek, in the Sixty-Mile district. At present it is being extensively prepared for a dredge which is to be placed upon the ground as soon as it is in a fit condition, that is, freed from frost. This is the only property in the Klondike that is thawing its underlaying gold-bearing gravels by the action of the atmosphere alone. To accomplish this effect, the overburden of frozen mud or 'muck' is first sluiced off, exposing the gravel below it. Nature does the rest; the result is proving decidedly satisfactory, and will reduce the final cost of extraction. This economical experiment is being watched with interest and will probably be generally adopted in the future. G. Lewington has charge of this company's mining interests in the Yukon Territory and Alaska. The Canadian Klondike Mining Co. is operating on the Boyle concession in the Klondike valley. They have a 7-ft. Marion dredge at work; this boat has handled more ground this summer than any other dredge in the Klondike, and the returns have been most satisfactory. A stationary plant situated at the mouth of Bear creek supplies this machine with power; the electricity is generated by steam-power, using wood as fuel, at a cost of $10 per cord, burning from 10 to 12 cords per day. This is not an economical plant. The conditions under which this dredge is operated are the most favorable in the Klondike, as all the ground is thawed, due to the fact that the machine is working in the bed of the Klondike river. River-beds are seldom frozen. The company has had four Keystone drills at work all summer in a systematic prospecting of the property; this work has been done in a most careful manner, and the results have been so good that it has been decided to put on another boat next year similar to their present machine; indeed, some of this machinery is now on the ground. Fred Rothschild is the manager of this Company, and Mark Summers is his able foreman.

The Yukon Basin Gold Dredging Co., of which William Ogilvie, former Governor of the Yukon Territory, is president, succeeded in getting its first dredge to work this summer. It is a small boat, with 3-ft. buckets, and built by the Risdon Iron Works. The Company controls about 50 miles of the Stewart river, a tributary of the Yukon, about a hundred miles above Dawson. It is expected that a number of the latest type of dredges will soon be put to work, as the results obtained with the small dredge used this season have been encouraging. I understand that this boat will be used in the future as a prospector, in much the same way as the boat of the Consolidated Gold Dredging Co. It is also a part of this company's plan to harness Frazier falls on the upper Stewart; these falls offer the best chance for generating power in the Klondike region. The Bonanza Basin Gold Dredging Co. owns a valuable property in the Klondike valley; it begins at the mouth of the Klondike river and extends up-stream for 1½ miles, and is partly within the townsite of Dawson. Most of it is thawed, which is a tremendous advantage; it is rich, accessible, and easy to work. At the present time they have a 7-ft. open-connected Allis-Chalmers dredge. This boat was originally a side-discharge machine, a type not at all suited to the conditions; last year it was re-constructed, and now is a regulation stacker type of boat, and this season has done excellent work. A much larger dredge is to be placed on this property, probably a 9-ft. Bucyrus. When completed, this will be the largest machine in the North. The Yukon Gold Co. is supposed to have absorbed this company.

Dominion creek, the Granville district, Sulphur, Quartz, Black Hills, and parts of Hunker creek, where mining is still done in the old way, have given a good yield of gold, and more winter work is under way this year than for some time. It is expected that many valuable dumps will be taken out, as claim-owners are starting up on ground known to be rich. Duncan, Haggart, Dublin gulch, and various tributaries of the McQuestion river, are also being worked more extensively than in the past and it is hoped that good results will follow. Duncan creek is very deep, being 100 ft. to bedrock, and only partly frozen, making it difficult to work; all prospects so far found indicate that this creek may yet prove rich. The Canadian Government has supplied the miners on this creek with pumps and machinery, which it is hoped will be the means of determining its value; this machinery is not operated by the Government, nor is any financial aid given; the miners must furnish all necessary fuel and labor. From this showing it is evident that next year's output will be larger than this year's, and so it will continue to be for many years to come.

TORONTO, CANADA.

Cobalt Booming.—New Companies.—Montreal River.

The Cobalt boom received a stimulus this week from a visit to the mines at the week-end by the members of the Standard Stock & Mining Exchange of Toronto, including representatives of nearly all the prominent brokerage firms of this city. They inspected the principal mines in which the public is interested, and were in nearly all cases afforded the fullest facilities to make a close examination. A fact which strongly impressed itself upon the visitors was the great change in methods in the direction of improved equipment and thoroughness of development on a permanent basis, in place of the haphazard and make-shift way of doing things characteristic of the earlier years of the camp. The change is undoubtedly due to the evidence that rich ore exists at depth, which has justified and rendered possible heavy expenditures on plant and buildings, and the adoption of policies looking to the future, instead of seeking the largest possible immediate returns. In several instances it was found that mine managers had their work arranged in detail for two years ahead, ore deposits being blocked out without any intention of immediate shipment. In view of the present low price of silver, some of

the companies are disposed to restrict production to an amount sufficient to meet expenses and pay current dividends, holding themselves in readiness to increase the output as the market improves. More attention is being paid to the important matter of lessening operating expenses, one of the means adopted to this end being co-operation between different companies in the opening up of veins which extend from one property to another. The rise in Cobalt stocks, which has been steady for some weeks, broken by occasional temporary reactions of short duration, has resulted in a large number of new flotations, some of them apparently of the wild-cat species. So many propositions have lately been sprung upon the public that, when the large amounts already invested in companies of acknowledged standing are considered, it is difficult to see where the subscriptions necessary to put them on their feet are to come from, and many of these ventures are likely to be still-born. Among the more promising which have passed the dubious stage so far as obtaining funds is concerned are the Gifford and the Otisse. The former, which, with a low capitalization, was largely over-subscribed, has been followed by the Gifford Extension, promoted by the same interests, on a larger scale. It is capitalized at $350,000, and will develop what has been heretofore known as the Calverly-Wetlaufer property. The Otisse is the first of the numerous Montreal River propositions put on the market, and has been well received. Many other properties in this section are included in the daily lengthening list of new flotations, and there is an increasing interest in this region, which, whatever be the fate of the present ventures appealing to the public, appears likely to divide attention with Cobalt in the near future. Late as it is in the season, the rush of prospectors and miners up the river continues unabated.

NEW YORK.

After-Election Talk.—Boom in Copper.—Lawson Advertising. — Ray Consolidated.—Nevada Con.—The Curb.

Now that the election is out of the way, the anticipated improvement has started. Men with unemployed capital have no longer an excuse for delay, and to this rather than to any radical change in business conditions is due the fact that it is now possible to obtain a hearing for new ventures. At the same time a great many of the statements that are published regarding men going back to work in factories, etc., are pure inventions. The industrial depression has been far too deep-seated to be removed in a day or two by the success of a political party. The feeling of confidence that now exists will undoubtedly lead to the extension of old, and the promotion of new, enterprises, and when these plans are executed the demand for materials will bring the factories back to their normal producing basis; but this is not the work of a moment, and the wild stories that are being circulated tend rather to retard than to advance the return of full prosperity. Boston has been having a remarkable boom in copper stocks; from the low point of 1907, 31 of the more prominent stocks listed on the Stock Exchange there have increased $306,000,000 in value. More recently, however, the Lawson advertising of Utah Copper has adversely affected the general market, as the public now pretty well understands that the object of the advertising is always to sell. The result of the latest effort, so far as can be ascertained, has been the distribution of 25,000 shares of Utah Copper stock from insiders to outsiders. When Lawson took up the Yukon distribution for the Guggenheims, he also got an option from them on stock in the Utah Copper Co., Nevada Consolidated, and Cumberland-Ely, held by the Guggenheim Exploration Co. and the Guggenheim family, amounting to $25,000,000. Lawson failed to swing things sufficiently to allow him to exercise these options, but probably got another call on Utah Copper. Apart from this, he is supposed to be preparing a large mining flotation, and is probably paving the way by publicly connecting his name with a really successful and well-managed property.

The shares of the Ray Consolidated Copper Co. are now being sold on the New York curb. The mines are at Kelvin, Arizona, and the ore occurs in large zones in the porphyry, carrying from 2½ to 3% copper, which will be concentrated 15 or 20 to 1. The Ray Consolidated is capitalized for $3,000,000 first-mortgage 6% bonds, convertible into stock at par until July 1, 1914, and 800,000 shares of stock, par $10. Of the 800,000 shares of stock, 300,000 shares are in escrow for the conversion of the bonds. There remains in the treasury $1,844,000 bonds and 184,400 shares of stocks. These treasury securities are under option to Hayden, Stone & Co. until July 1, 1909; this firm will finance the equipment of the mines and erection of a mill if developments continue satisfactory. The company now has approximately $275,000 cash on hand to continue developments. The president of the company is Sherwood Aldrich, of Shove, Aldrich & Co., Colorado Springs. The vice-president is D. C. Jackling, of Salt Lake City, who is vice-president of the Utah Copper Co. The directors are Messrs. Aldrich, Jackling, and Shove, J. G. Gordon, of London, Spencer Penrose and C. M. McNeill, of the Utah Copper Co., A. Chester Beatty, and S. W. Mudd, who is consulting engineer. The executive committee comprises Messrs. Jackling, Beatty, and Mudd.

Advices from Cobalt continue encouraging, and the camp is now looked on with a good deal of favor. The price of silver is very low, but this is not of so much importance, because the metal is produced so cheaply; for example: a rise of 10% in the price would mean an extra profit in some mines of only 12 to 15%, while in other districts such a change would mean the difference between profit and loss. As public attention is directed toward Cobalt, the Goldfield and other Nevada stocks are somewhat neglected, but their turn should be coming shortly.

In the second annual report of the Nevada Consolidated Copper Co., James Phillips, Jr., the president, says it is confidently expected that construction of the additional unit, the fifth of the series, will raise annual production of blister copper to approximately 70,000,000 lb. From data at hand, it may be accepted with confidence that in January 1909, monthly production will be equivalent to an annual production of at least 35,000,000 lb., and that by April next, when additions to the concentrating and smelting plant under way are completed, increased facilities will result in raising annual output to 50,000,000 or 55,000,000 lb. Should Mr. Yeatman's recommendation that still another unit be added meet with the favorable consideration reasonably to be expected of the incoming board, it is well within probability that by September next the company will take its place as one of the six largest copper-producing companies of the world. At the annual meeting the following directors were elected: S. W. Eccles, James Phillips, Jr., W. Hinckle Smith, F. W. Hills, Charles Hayden, C. Hartman Kuhn, director of the Girard Trust Co. of Philadelphia; W. B. Thompson, J. K. MacGowan, Williard S. Morse, John N. Steele, and W. E. Bennett. C. Hartman Kuhn succeeds A. Chester Beatty. He is a director of the Girard Trust Co. of Philadelphia, and was added to the board at request of large Philadalphia holders of the stock.

In the meantime an increasing interest is being taken in the stocks on the New York Curb market. A good deal of unfavorable comment has been excited by the manipulation lately of the Orphan stock and of other mining stocks. Owing to the peculiar nature of the Curb it is impossible to regulate all the business done there; the New York Stock Exchange does not permit its members to have dealings with any other organization, and therefore the Curb is not a corporate body at all. The majority of the brokers who conduct business there are willing to abide by such customs as are considered usual and advisable, but at the same time no penalty can be inflicted on those who do not conform to the rules. The situation is a delicate one, but a genuine desire exists among the brokers to avoid the abuses that have existed, and to bring to the greatest possible state of efficiency the business of providing a market

that can be used by Stock Exchange houses or others to deal in those shares which for some reason are not suitable for listing on the regular exchange. In pursuance of these ideas, the following notice was issued by the New York Curb Market Agency:

"October 8, 1908. Listing notice. On and after this date all applicants to list stocks will be placed on the blackboard for general inspection and information five days before any sale can be recorded on any of the regular Curb lists. Objections may be filed at this Agency for immediate investigation."

And appended are the forms to be filled in and exhibited. By this means the manipulation of 'wild-cats,' and subsequent publication of fictitious curb quotations as representing real market values, is largely avoided, and the Curb will be much strengthened in its claims to be considered by the public as the recognized and reputable market for mining stocks.

MEXICO.

Gold at Guanajuato.—New Developments.—Aerial Trams. — Electric Power.—Zacualpam.—El Oro.—Sinaloa. —Activity in Chihuahua.

Notwithstanding the unprecedented activity in the old camp of Guanajuato, it does not seem to be able to get beyond a weekly production of about ₱300,000, of which one-third is shipped in the form of ore and concentrate and the remainder as fine bullion from the cyanide mills. It is the continued low and lowering price of silver that has kept down the figures in the value of the production, for the actual number of ounces produced has constantly increased, while the increasing gold production during the last two years is noteworthy. As mentioned in these letters some months ago the higher gold values are found in the system of cross-veins tributary to the Veta Madre; these were first proved of a commercial value in the Carmen mine, and the rich bodies in this small property led to the opening of the Pinguico, which developed into one of the richest mines on the continent, and led to the deepening of the workings on the adjoining Humboldt, now also approaching the producing stage. Of the others with important gold values are the Nayal, with its own little mill; the Tres Coronas, where a mill is in course of construction; and the Guanajuato Gold Mining Co., working the Jesus Maria mine, where a 100-stamp mill was erected to treat the old dump, but untouched because of the excellent bodies of pay-ore developed in the old workings. Work is also being pushed on the Providencia, near the Pinguico, by the Guanajuato-Providencia M. & D. Co., controlled by Obadiah Sands and associates, of Chicago; and of the San José de Gracia by the Mexican Mines Prospect Co., of Mexico City. The success of the aerial tram between the Cata mine and the Bustos mill of the Guanajuato Reduction & Mines Co. has resulted in a similar tram being built from its Tepeyac mine, and it is understood that the ore is now trammed from mine to mill at a cost of 6 centavos per ton, as against a former cost of ₱1 per ton by burros. For the Sirena mine, of the Guanajuato Consolidated, the pioneer of the modern companies in Guanajuato, two new shafts are being planned. On the Ruby Silver property, adjoining the San José de Gracia and recently purchased by John Donaldson, the tunnel is being pushed and good gold ore is being developed; the new work in the San Cayetano is most promising; and the drainage adit of El Cubo is progressing rapidly. The Tajo de Dolores, near the Peregrina and El Cubo, has been taken over on the W. M. Wiley option by Catlin & Powell for the Proprietary M. Co. of America, and though but a depth of 300 ft. has been attained, it is stated that ore with a gross value of ₱2,000,000 has been blocked out and foundations are ready for a 60-stamp mill. The vein, however, has been proved in El Cubo to a depth of 1300 ft. The great call upon the Guanajuato Power & Electric Co., by reason of the developments in Guanajuato, has forced the company to add to its plants at Pandicuaro and Zacmora, the which when completed, will give the company a capacity of 20,000 horse-power.

Another camp that, like Guanajuato, though much smaller, has shown the result of the stimulus of electricity and cheaper power, is Zacualpam in the State of Mexico. Two years ago the majority of the properties were working in a desultory manner, whereas now, all seems to be in a most prosperous condition. The Seguranza, formerly known as Las Coronas, is in veritable bonanza and a 100-ton cyanide plant has been ordered. The Olvidada has driven 25 metres in ore and now reports a rich strike. High-grade ore is also being developed in the Carboncillo, the Gerardita, the San Fernando, and the Alacran, this last reporting assays as high as 2000 oz. silver and 30 to 40 oz. gold. The Guadalupe de los Arcos is preparing to resume. Cyanide is the password for this camp.

From El Oro nothing new is reported, but the Descubridora is cross-cutting east and west on the 780-ft. level, and it is expected the Descubridora vein will be cut during November. The Campechano, Triumvirato y Anexas, 10 miles northeast of Leon, in the State of Guanajuato, which has large bodies of low-grade lead and copper ore, has resumed operations and has its new 40-ton mill running at full capacity and is shipping out a carload per week of lead concentrate. The mill will probably be enlarged when prices warrant an increased production. In Sinaloa, the Guadalupe de los Reyes has ordered a steam-electric plant for its mines and reduction works, as has also the Tajo Mines Co., of Rosario, which has placed a $20,000 order with the General Electric Co. The Benito Juarez M. Co., of Salínas, San Luis Potosí has ordered a large mill and cyanide plant. The Certichena, in Tepic, with a good body of $15 gold ore, will soon increase its recently constructed 6-stamp mill to 15 stamps.

The Santa Eulalia Exploration Co., in charge of F. Chappellet as assistant manager, and J. H. Gilmore as mine superintendent, is shipping an average of 2800 tons per month to the El Paso smelter, from its Buena Tierra mine. This ore carries 25 oz. silver, 10% lead, 32% iron, 11% lime, 3% manganese, 15% silica. It pays a penalty of 10c. per unit on the silica. The Buena Tierra shaft goes 600 ft. through the rhyolite cap, continuing 800 ft. deeper in the limestone. At the 500-ft. station a cross-cut was driven to cut the limestone on its dip, and at this place the orebody was opened. From other lower stations levels were driven to the ore. Steam-power is employed in hoisting and operating an 8-drill Sullivan air-compressor. The Santa Eulalia mines of the American Smelting & Refining Co. are producing and shipping about 7100 tons per month of silver-lead ore, these shipments being divided between the Chihuahua and El Paso smelters of the company. Its Mina Vieja produces a silicious silver chloride ore, averaging 100 oz. silver per ton; a lime manganese ore, averaging 30 oz. silver, the lime therein running 47%; a sulphide ore, carrying 150 oz. silver per ton and running 50 to 60% galena. The three kinds occur side by side in the same orebody and are mined and shipped separately. Its Santo Domingo mine produces a low-grade lead ore, which is sent to the Chihuahua plant. A 1000-ft. shaft has been sunk on its Velardeña property, opening bodies of silver-lead ore at the 50 and 750-ft. levels, but no shipments have been made as yet.

An electric plant has been built at the Santo Domingo to generate power for the electric hoists installed at the Mina Vieja and Velardeña. The steam-hoist at the Santo Domingo is still in use. It is probable that the underground workings of the three properties may be connected and the 1000-ft. shaft of the Velardeña be made the main working shaft. An aerial tramway, built by the Trenton Iron Works, two miles long, is being erected from the Mina Vieja to the Santa Eulalia station of the Mineral railroad. W. A. Mitchell is in charge of these properties.——The Chihuahua and Potosí mines are shipping 400 tons of ore per day, 100 tons of which is zinc ore and this is shipped to the zinc works at Gas, Kansas. A new hoisting plant is being installed at the Potosí; it has a double drum and will operate skips to a depth of 1800 ft. This hoist is installed

on the tunnel level, 3600 ft. from the portal, and is operated by compressed air. The Esmeralda and Fortuna are under lease to Howard Anderson, G. B. Jacobs, and others. The former is near the Mina Vieja, has an 815-ft. shaft and 600 ft. of other work, and has made some shipments of silver-lead ore; the latter is situated in the middle of the Carman group, has considerable old development, and has silicious iron and silver ore. The Veta Grande, in charge of A. H. Donnewald, has sunk a shaft to 40 metres in the porphyry formation, southeast of Santa Eulalia, purely as a matter of exploration. The sinking will continue until the porphyry is passed through and the limestone is encountered. If ore in paying kind and tonnage is found here it will have the effect of starting other work in that vicinity.

LONDON.

Lead Mining.—Linares.—Lena Goldfields.—Siberian Companies.—Kyshtim Corporation.—Prospecting for Platinum.

The havoc played on lead mining companies by the depressed market for the metal is well shown in the case of the Linares company, which owns mines in the Linares district of Spain and a smelter at Cordoba. The mines have been worked continuously by the present organization for 56 years, and operations have been directed all the time by John Taylor & Sons. During recent years the management of the mine has been in the hands of Ernest R. Woakes, an engineer known on the American side. The properties are not big producers, but the orebodies are extensive, and on the small capital outlay have for many years yielded handsome dividends. For instance, on the capital of £45,000 a dividend of £11,250 was paid for the year ending June 30, 1907, being at the rate of 25%. Seeing that the mine has been successful for so many years, we cannot help regretting that the results for the 12 months ended in June last have been seriously affected by the low price of lead, and that the profit has been wiped out altogether. At the beginning of the 12 months the market price for lead was £21 per ton, and at the close only £12½, a drop of no less than £8½. The expenditure during the year was £99,550, of which £66,301 represented outlay in Spain, £31,-103 purchase of tributers' ores, and £2146 expenditure in London. On the other side of the account there is a revenue of £78,788 from sales of lead and an increase in the stock account for unsold products of £15,453. The balance of expenditure is therefore £5308. The total sales of lead were 4066 tons, realizing £74,094, or, after paying freight, insurance, etc., £71,473. In addition, £7116 was realized by the sale of ore and carbonate locally. The lead sold consisted of 3134 tons of first-class lead, realizing £55,371; 640 tons of rich lead, £14,017; and 292 tons of refined lead, £4706. The prospects of the company for the coming year depend chiefly on the course of the market in metals, but there is also some likelihood of an increased output, owing to another property having been leased and developed to a promising condition.

In a recent issue I gave some particulars of the flotation of the Lena Goldfields Limited, a company formed to acquire extensive tracts of auriferous gravel in the far northeast of Siberia. At the time I cited this flotation in proof of the statement that money was once more becoming available for new mining enterprises, and later on I had to confess that the delay in carrying through the flotation was an equally clear indication that times were bad. It is therefore all the more satisfactory to be able to report now that success has attended the efforts of the directors and that the company will be able to go forward with the scheme. The Lena Goldfields has been floated by the Russian Mining Corporation, a company formed by the Venture Corporation in conjunction with the Consolidated Gold Fields of South Africa and the Consolidated Mines Selection Co., with the object of taking up all kinds of mining business in the Russian Empire. The directors had the advice of C. M. Rolker in the acquisition of the option on the Lena property. The capital of the Lena Goldfields Limited is £1,405,-000, in shares of £1 each, of which 954,600 go as purchase price, 236,500 were offered for subscription, and 153,900 held in reserve. The number of shares allotted is 168,088 out of the 236,500 offered, and the subscribers have paid up in full. The company therefore starts with plenty of working capital, and it has every prospect of success. The Russian Mining Corporation has other interests of which we shall hear something shortly, notably the platinum properties that have already been acquired by the Precious Metals Syndicate.

Another Russian proposition of importance now prominently before the public is the Kyshtim Corporation, which has been formed to take over a great tract of country in the government of Perm and south of Ekaterinburg. These estates are rich in timber and arable lands, and contain important deposits of iron ore and gold and copper ores, and only the introduction of new capital and modern methods are required to develop them into profitable properties. Of the timber resources and the agricultural lands I need not write, as they are out of your province. The iron mines have been worked for many years and charcoal iron made on a comparatively small scale in old-fashioned furnaces. The company is to equip new furnaces and go ahead on a larger scale. It is, however, the gold and copper deposits that are of the greatest interest. These are situated in the Soimonovsk valley, and consist of four distinct properties. They have all been worked in a desultory manner by the local owners for many years, but hardly any machinery has ever been used. The ore has been raised from a large number of shafts by horse-whims, and no pumping has ever been done. The work of the promoters of the new company has been centred chiefly on the Koniukoff mine, which contains refractory gold ore in the higher levels, changing into copper ore at 250 ft. down. There are three other mines of similar character, but they will not be tackled just yet. The exploration and development work has been directed by H. H. Knox, of New York, and the metallurgical work is in the hands of his partner, J. H. Allen. The services of W. A. Carlyle as consulting engineer have also been requisitioned by the company. At the present time the Koniukoff mine has available reserves amounting to 550,000 tons of ore running 4% copper and 2 dwt. gold, and future development will no doubt disclose further supplies. The old smelters have been re-modeled and small temporary furnaces fitted up, capable of treating 150 tons per day. Plans are being drawn for erecting new and up-to-date furnaces for treating 500 tons per day, together with converter plant and electrolytic refinery. When these are in full operation they will produce 4500 tons of copper per year. It is probable that the whole produce of the mines will be sold within the bounds of the Russian Empire, so that under the existing high tariff a good deal better prices will be obtained than if the metal were exported. It is only necessary to add that the board of directors is a very strong one.

While writing of Russian alluvial mining, it is not out of place to mention the Platinum Corporation. This company was formed over a year ago by a firm of dental manufactures, Claudius Ash Sons & Co., for the purpose chiefly of obtaining a supply of the metal for their own purposes, but also of producing and selling platinum to other users of the metal. The properties to be acquired were situated in the Perm government, whence most of the platinum comes at present. Great difficulties appear to have arisen on all the properties so far examined, owing to the inability of the company to acquire the consent of the agricultural interests. For this reason several of the properties have had to be abandoned, and the corporation has not yet been able to proceed with any of its schemes. At the present time it has an option for 12 months on a property of considerable extent. The prospecting of this property is to be undertaken by a subsidiary syndicate formed for the purpose. F. W. Linck and J. Chisholm are devoting their attention to the work. The corporation will find most of the money required by the syndicate, but other people are also subscribing.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Briquetting iron ore, in order to increase the blast-furnace output, is practised to some extent in England.

The Kalgoorlie water supply contains only 24.24 gr. of solids per gallon, of which 0.17 gr. are solids in suspension.

A steam-shovel on the Panama Canal recently handled 55,419 cu. yd. of soft rock in 25 working days. The machine has a 5-yd. dipper and weighs 95 tons.

Water sterilization by ozone is practised regularly in the Pittsburg Homeopathic Hospital, where about 100,000 gal. per day are treated, at a cost of 25c. for current.

A coal-handling record was recently made at the new Naragansett Bay Naval Coaling Station, when 2027 tons of coal were taken from the collier *Nero* in 7 hours and 10 minutes.

Citizenship of a native-born citizen is proved by his own statement. If naturalization or declaration of intention is the issue, the proper proof is the production of a certified copy of the record.

A brick building, in Chicago, five stories high and estimated to weigh 6000 tons, was recently moved 52 ft. parallel with its width, and then 168 ft. parallel with its length, without mishap or damage to it.

Hot-air heating by utilizing the waste heat of a gas engine is a feature at a Pennsylvania manufacturing plant. Both the exhaust gases and the jacket cooling water are used to heat fresh air, which is circulated by a fan.

An oval blast-furnace, having an inside minor axis of 10 ft. and a major axis of 18 ft., was recently blown in at an English smelter. The object of the novel shape is to reduce the distance from the tuyeres to the centre of the furnace, and thus decrease the pressure of the blast.

Concrete of maximum strength and density requires enough rich strong mortar to fill all the voids of the broken stone, gravel, or other aggregate used. If a cheaper concrete is desired, decrease the amount of cement, but use enough of the leaner mortar to fill the voids of the aggregate.

Aluminum is being used in the construction of punching presses, in order to secure high-speed operation. The Standard Machinery Co., of Providence, claims that, because of the lightness of an aluminum plunger and connections in a machine which it has recently built, a speed of 600 strokes per minute has been attained.

Magnesium carbonate is not essential in a rock intended for burning into natural cement, although in the past it has been so considered. On the other hand, silica, alumina, and iron oxide are required to give the hydraulic properties to the resulting product.

The specific gravity of stone or a porous substance is obtained by weighing an absolutely dry sample; weighing the same sample suspended in water, being sure to allow sufficient time for thorough saturation; and then weighing it again in air, removing only the surplus water on the surface. The specific gravity is equal to the dry weight of the stone divided by the difference between the weight of the saturated stone in air and in water.

A thermo-electric couple, for measuring temperatures of molten metals, can be cheaply made by using different forms or grades of graphite for the two elements. It is said that a particularly satisfactory couple is one in which one element is pure carbon or graphite and the other is the same substance combined with 15 to 20% of Bavarian clay. These elements are capable of withstanding extreme heat, and they do not appreciably alloy with most molten metals.

The pressure of wind has been again under investigation at the National Physical Laboratory of England. The experimenters found that for surfaces of 25, 50, and 100 sq. ft., exposed on the top of a tower 50 ft. high, the values of the constant k in the formula $P = kv^2$ were identical. Its value, in units of pounds per square foot and miles per hour, was found to be 0.0032. Further experiments show that the resistances of complex structures may be safely predicted from small models.

Painting concrete should not be attempted until it has stood at least one summer. When the surface is thoroughly dry, wash it with an 8% solution of muriatic acid, which should afterward be washed off with plenty of clean water. After allowing the concrete to again become absolutely dry, the priming coat may be applied. It should contain so much turpentine that it is almost flat. The oil in the successive coats should be increased, and each one allowed time to dry thoroughly before the next is applied.

A producer gas dredge is excavating a canal in Iowa with a low coal consumption. The machine is of the bucket-ladder type, and delivers the material to the spoil bank on each side of the canal by two 80-ft. pan conveyors. The elevator is equipped with 66 buckets of 9 cu. ft. capacity, dumping at the rate of 40 buckets per minute, which gives a capacity of 19,000 cu. yd. per 24-hr. day. The dredge is operated by a 150-hp. producer gas engine, using pea-size anthracite coal in the producer. The engine also drives a 35-kw. generator, which supplies power for motors operating the pan conveyor, and current for lighting the dredge. The coal consumption is about 2 tons per 24-hr. day, of which 20 hr. are actual mining time. This type of plant was used because of the difficulty of transporting fuel across the adjacent bottom lands.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Government Assistance.

The Editor:

Sir—On visiting the underground workings of the Comstock Lode lately, I was impressed with the financial difficulties under which the Comstock Pumping Association is laboring in draining and ventilating the mines. The work of keeping in repair the Sutro Tunnel and its laterals is handicapped at every point for the want of adequate funds. Instead of being able thoroughly to renew and repair the timbering, the management can only take the worst places in hand. The total expenditure, working in this piecemeal way, is much greater than would be the case if funds were available to carry on the work in a thorough manner.

It is repugnant to Americans to have government interference in such work, but it seems to me that if ever government assistance to mining was warranted it is here. The companies themselves cannot efficiently do what should be done. None of them has the funds to do so, most of them have not shareholders who would submit to be assessed, and those which could raise the money would not be justified in undertaking by themselves what would accrue to the benefit of all. Even supposing that all the companies were in a position to pay, it would be impossible to arrive at an agreement as to the proportion of the expenditure to be borne by each.

The State of Nevada should establish a board to take a hand in the removal of the water at present being pumped, and the further quantities which will be encountered in the deepening of, say, two shafts. This board should be authorized to make a bond issue, the principal and interest of which would be guaranteed by the State of Nevada. The tax-payers should have no objection to the State becoming responsible for such a bond issue; the members of the farming community should be willing, because they benefited for many years from the money disbursed at Virginia City; the miners should be willing to help their brothers who are at present 'up against it'. The board should have the right to levy a tribute on all ore taken out from any of the mines benefited by the drainage system. The amount of the bond issue and the tribute to be levied should be determined after investigation by some competent authority. As to the composition of the board, it seems to me that public-spirited men might be found to take the appointments at merely nominal fees.

I do not know if what I propose is practicable under the conditions that prevail here, and quite appreciate that if the thing were taken in hand there would be many difficulties to overcome; but I am certain that if the same conditions existed in the Transvaal or Australia, something of the sort would be done.

Because a mine has been a large producer, it is of course not certain that it will be again, but in this case, as the geological conditions remain unchanged at the deepest levels, it is reasonable to suppose that valuable deposits will again be found. Indeed, from a cursory inspection of the underground maps, I think it very likely that, if the managements had the drainage problems off their hands, they would discover bodies of pay-ore without sinking farther.

FRANCIS DRAKE.

San Francisco, November 9.

Copper Averages at the Nevada Consolidated.

The Editor:

Sir—Referring to the article by M. L. Requa, 'Experimental Mill of the Nevada Consolidated Copper Co.,' in your issue of July 18, the method given for calculating the approximate extractions is worth discussing. Mr. Requa's carefully drawn up figures yield much information, but the method of arriving at the approximate extractions is surely not quite correct. Among the details are the following headings: 'dry crude ore in pounds,' 'percentage of crude copper,' 'percentage of copper in the tailing,' 'percentage of approximate extraction,' and so forth; the figures under each heading are added up; and the sum is then divided by the number of 'lots' to get the average in the case of each heading. The question is, should the percentages of extraction be so divided? On one occasion I was checking some figures of 'heads' and 'tailing' from the returns of a gold-milling plant, and the same thing was done to obtain the theoretical extraction; but another method gave a difference of 2½ per cent.

In the case under discussion the different 'lots' vary in weight. Should not one of the following methods be adopted?

No. 1. Multiply the 'approximate extraction percentage' for each lot by the respective tonnage, add the products, and divide by the sum of the tonnages. By this this method the following differences are obtained in the case referred to:

	Requa.	Parsons.
200-ft. level tests	73.89	73.93
300-ft. level tests	75.88	75.58
500-ft. level tests	75.51	74.92

No. 2. Obtain the average of the whole, first, by multiplying the tonnage of each lot by the assay percentage of that lot, add the tonnages together, and then the multiplied results obtained; divide the total tonnages into the sum of the multiplied results; then in the same way multiply the tonnage of each lot by the copper percentage in the tailing of that lot, and from the two figures obtained calculate the average extraction. The following are the comparative results:

	Requa.	Parsons, No. 1.	Parsons, No. 2.
200-ft. level tests only...	73.89	73.93	73.64

The differences are insignificant, but the question is, which is the correct method? Mr. Requa has taken no account of the varying tonnages of the lots; he simply divides the sum of the extractions by the total number of the lots, and though it makes little difference in this case, in others it might amount to

a larger figure.

The following simple example will explain what I mean:

EXAMPLE.

Tons.	Heads, Copper, %.	Tailing, Copper, %.	Extraction, %.
20	10	1	90
40	20	4	80

According to Mr. Requa's method, the following would be the averages:

Tons	60
Head value	15
Tailing value	2.5
Extraction	85%

This appears to be wrong. The other methods give different results:

BY METHOD NO. 1.

Tons.		Extraction, %.		
20	×	90	=	1800
40	×	80	=	3200
60				5000

$$\frac{5000}{60} = 83.333\% \text{ extraction.}$$

BY METHOD NO. 2.

Tons.		Heads, Copper, %.		
20	×	10	=	200
40	×	20	=	800
60				1000

$$\frac{1000}{60} = 16.666\%, \text{ average copper content in heads.}$$

Tons.		Tailing, Copper, %.		
20	×	1	=	20
40	×	4	=	160
60				180

$$\frac{180}{60} = 3.000\%, \text{ average copper content in tailing.}$$

Thus from 60 tons of 16.666% Cu in heads and 3% in tailing, the extraction would be 82 per cent.

CYRIL E. PARSONS.

London, October 12.

[We submitted Mr. Parsons' letter to Mr. Requa, and the reply of the latter is given herewith. It explains the point raised.—EDITOR.]

The Editor:

Sir—There can be no question regarding the correctness of Mr. Parsons' method of arriving at the correct value of ore. The use of foot-ounces or foot-dollars is, of course, the only way to get the actual value of developed ore. This method gives the proper value to each block of ground in estimating tonnage. In the case of the Ruth mine, however, giving to the various lots the value dependent upon their weights would have produced an erroneous result. The lots did not represent any specific tonnage. On the contrary, in order to arrive at a fair and accurate average, the weight of the lots necessarily must be neglected in the computation. For instance, take the lot of September 24, 140,000 lb., assaying 2.8% copper. This lot was far in excess of any of the others, but it did not represent any such excessive tonnage in the mine as would be indicated by the weight of that particular lot. The method of sampling was to take as nearly as practical an equal number of pounds each day from a given number of linear feet. It so happens that the character of the orebody of the Ruth mine is such that a variation of several thousand pounds in a lot would in all probability make no difference in the final result, but giving a value to the weight of the lots in proportion to the total weight might produce an erroneous result. The Ruth orebody is a very different problem from the sampling of an ordinary vein of a few feet in width that swells in and out, so that it is necessary to use the foot-dollar or foot-ounce method in order to arrive at the gross value of the tonnage developed. The Ruth orebody is a mineralized porphyry roughly wedge-shaped with the small end up; it has an extreme area of something like 1000 ft. long and 350 to 400 ft. wide, with ore still in the north faces of the cross-cuts.

In my opinion, the only way to arrive at a fairly accurate value of this ore is to take the value of a great many samples, neglecting the tonnage represented by any one particular sample, then carefully calculating the contents of the area of ore exposed, and applying to it the average value as determined by these samples. It would be impossible to take any one sample or any dozen samples and specifically say that they represented so many tons of ore of this grade. The orebody as a whole is extremely uniform over large areas and hundreds of samples, but there are some erratic occurrences of enriched and leached zones over widths of 10, 15, or 20 ft. or more that if segregated and applied to an individual area might produce results not at all in keeping with the average of the orebody as it will be mined. For this reason no value was given to the percentage of tonnage represented by any one lot in making the mill-tests.

M. L. REQUA.

San Francisco, November 11.

Chlorination in California.

The Editor:

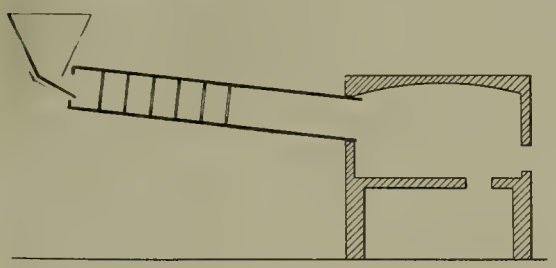
Sir—I have read with interest and carefully digested the article on 'Chlorination in California,' by Wilton E. Darrow; but in my experience a mechanical roasting furnace does not give the dead roast requisite for the highest efficiency of chlorination.

It is true that hand-rabbled reverberatories will leave unoxidized lumps and fused sinters, unless most skilfully and conscientiously attended. It is also true that, in general, the addition of salt to the charge before, or at the time of, dumping to the hearth, will clinker the sulphides, and volatilize the gold; and, if the concentrate contains tellurides, as much as 40% of the gold will be carried away, and be partly condensed when touching any cold surface. This was proved, with great personal loss, by C. H. Aaron, when he was operating a chlorination plant at Melrose, in the early eighties, until he found a yellow sublimate of pure gold on the outside of the brick walls of the furnace, above the rabbling-doors.

He was at the time working concentrate from the Murchie mine of Nevada county, which contained appreciable amounts of both tellurium and selenium, in the form of nagyagite, locally called galena or 'blue mineral'. This concentrate also carried 3½% of copper, and was high in silver, with a total value of $384 per ton. Other shipments of concentrate from the same mine were tried at the different chlorination works, but none of them could save more than 80% of the value, though allowing 90% on the assays made at the plants.

Then mechanical furnaces of the Bruckner and White-Howell types were tried, with equally poor results. Finally we found a plant where the assays of both the mine and plant samples exactly tallied, and a trial was made here, at which I assisted, on about 50 tons of the concentrate. The results were very good: 98% of the silver, 99% of the gold, and sufficient cement copper to pay for the actual working charges. I have not heard of the furnace for years, and whether it was held under patent right or not I do not know. It was called the Crosby furnace, and allowed perfect control of the final desulphurization.

Briefly stated, it consisted of a revolving cylinder, open at both ends, and with lifting divisions to carry the sulphides up, and drop them through the flame.



Sketch of the Crosby Furnace.

It was set at a slight angle, the concentrate was fed continuously at the upper throat and automatically dropped on a stationary hearth, 10 ft. square, fed by a wood fire at one side, and with a stirring-door in front, and a bottom discharge. When sufficient partly oxidized concentrate had accumulated on this hearth, it was hand-rabbled until a sample showed only the faintest trace of sulphate by the addition of barium chloride. Then a charge of less than 2% of salt was added, quickly stirred with the roast, and immediately all was discharged and spread out to cool.

As Von Bibber writes, "The first blow generally decides the battle," and the subsequent chlorination was so efficient that we were able to get the high extraction stated above. The leach carried nearly all the copper, and after the precipitation of the gold by ferrous sulphate, the resultant liquor was run through sluices in which had been placed wrought-iron scrap, and the copper was saved in the form of cement. The leached roast still carried the silver, and this was extracted in other tanks, by hydrosulphite of soda.

From my experience on this complex and high-grade concentrate, as well as later practice with different types of mechanical furnaces, I would strongly advise the finishing by hand-rabbling, no salt to be added till just before discharging, and then in the smallest amount to neutralize the silver, zinc, lead, and copper present. Eliminate all the sulphate, and add no sulphuric acid, as the salt will prevent any undue consumption of chlorine gas, and, when the salt is added in this way, it will not volatilize any appreciable amount of gold, nor imprison it in a non-porous slag. Prepare your concentrate in this way and the subsequent high extraction of the gold will be easy.

W. J. Adams.

San Francisco, November 5.

In testing for tungsten, unless the suspected mineral be present in quantity, the material should be concentrated by panning or careful selection. To test scheelite, place a portion of the powdered mineral the size of a pea in a test-tube or cup, and cover with a teaspoonful of hydrochloric acid. Upon boiling a few minutes or, if not heated, allowing to stand a considerable time, tungsten trioxide, WO_3, a bright yellow powder, is formed. Upon dropping metallic tin or zinc into the cup the yellow powder is reduced to a lower oxide, which is of a beautiful blue color, and later to still lower oxides of other colors. With zinc the solution first turns blue, then wine colored, and later brown. When the reduction takes place quickly the blue color of the solution may not be seen at all, the first color to appear being a reddish lilac, quickly turning brown. With tin, it turns successively blue, lilac, wine colored, and more slowly to brown. The wine color may last for hours. Tinfoil, which is ordinarily composed largely of tin, with varying amounts of lead, may be used. In the reduction with tin the solution nearest the tin will often have a lilac or wine color, while a short distance away the solution will be a fine blue. With either zinc or tin the powdered mineral itself will be colored blue, even though the solution may be of a different color. When treated with acid several minutes should be allowed to elapse before introducing zinc or tin; otherwise the yellow oxide may not be formed in sufficient amount to give a good reaction, and neither the blue nor the pink color will be seen, but the solution will be a yellowish brown. However, a blue sediment will form in the bottom of the vessel. If one part of hydrochloric acid diluted with two parts of water be used, tin gives to the solution a blue color which lasts a considerable time. Sulphuric acid diluted with two or three parts of water may be used instead of hydrochloric, and seems to be the more active of the two in changing scheelite to tungsten trioxide. It is slower than hydrochloric acid in reducing the yellow oxide to the blue oxide upon the addition of zinc, and needs more heating, but gives the same blue color, which is more lasting and may still show after standing 24 hours. With tin, sulphuric acid acts still more slowly, and requires considerable heating, but gives the same lasting blue color. Nitric acid gives the yellow tungsten trioxide, but will not give the further reactions.

THE ESTIMATION OF SULPHO AND FERROCYANIDES IN CYANIDE SOLUTIONS CONTAINING COPPER.

By Leonard M. Green.

*In the majority of working solutions obtained in the cyanide treatment of silver ores, and also in many solutions obtained in the treatment of gold ores, copper is present. This element, even in small amount, enormously complicates the determination of ferro and sulphocyanides, and usually prohibits their determination by ordinary methods. This is due to the fact that both cupric and cuprous double cyanides exercise a reducing action on permanganate in acid solution, and that they precipitate both ferro and sulphocyanides. If, therefore, acidified permanganate be titrated with a solution containing sulpho and ferrocyanides in presence of cupric and cuprous double cyanides, the reducing power is equivalent to the sulpho and ferrocyanides plus the reducing power due to the copper compounds, and, in order to find the reducing power due to the two former constituents, that due to the latter must also be determined. Again, in the separation of the ferrocyanide from the sulphocyanide by precipitation as prussian blue, some sulphocyanide may be precipitated as cuprous sulphocyanide along with the ferrocyanide precipitate, and thus escape estimation as sulphocyanide.

Before suggesting tests for the determination of the constituents it will be of interest to describe some of the reactions which may take place during the testing and treatment of such solutions.

The cyanide in combination with copper in a cyanide solution is not indicated by the ordinary silver nitrate and iodide test, but with certain precautions it may be estimated by titration with mercuric chloride. If the solution be directly titrated with mercuric chloride no definite end-point is obtained, for the indication will be affected by the quantity of protective alkali and of certain other salts present.

If, however, the protective alkali be neutralized and an excess of ferrocyanide be added, together with a few c.c. of potassium mercuric iodide indicator ($HgI_2.2KI$), a perfectly definite end-point is obtained, corresponding to the alkaline cyanide plus the zinc double cyanide plus the cuprous double cyanide plus three-quarters of the cupric double cyanide. The mercuric chloride first attacks the alkaline cyanide and then the zinc double cyanide (if present), forming mercuric cyanide, zinc ferrocyanide, and potassium chloride.

$$2KCy + HgCl_2 = 2KCl + HgCy_2.$$

$$6K_2ZnCy_4 + 4K_4FeCy_6 + 12HgCl_2 = 12HgCy_2 + K_4FeCy_6.3Zn_2FeCy_6 + 24KCl.$$

It then attacks the cupric double cyanide, neutralizing ¾ of the cyanide which it contains.

$$12K_2CuCy_4 + 4K_4FeCy_6 + 18HgCl_2 = 18HgCy_2 + K_4FeCy_6.3Cu_4FeCy_6 + 36KCl + 6Cy_2.$$

The cyanogen set free in this reaction probably either decomposes or passes off as gas, but in the presence of an excess of ferrocyanide a small amount may perhaps form ferricyanide, which does not interfere with the other reactions. Finally it attacks the cuprous double cyanide, combining with the whole of the cyanogen it contains.

$$12KCuCy_2 + 4K_4FeCy_6 + 12HgCl_2 = 12HgCy_2 + K_4FeCy_6.3Cu_4FeCy_6 + 24KCl.$$

The next drop of mercuric chloride solution attacks the indicator, forming a red precipitate of mercuric iodide.

$$HgI_2.2KI + HgCl_2 = 2HgI_2 + 2KCl.$$

This test, therefore, indicates the alkaline cyanide plus the zinc double cyanide plus the cuprous double cyanide plus ¾ of the cupric double cyanide in terms of KCy, and starting from this point it is possible to devise tests to differentiate the various salts included in this total. Instead of neutralizing the protective alkali, practically the same indication is obtained by adding a little bicarbonate of soda, for although alkaline hydrates influence the titration, carbonates and bicarbonates barely affect the result. It was formerly considered that this test indicated the whole of the cyanide combined with the copper, but this would involve the formation of cupric ferrocyanide, and I have noticed that even in solutions containing large amounts of cupric double cyanides there is barely a trace of pink color in the precipitate formed, which remains almost milk-white throughout the test, showing that, even from the cupric double salt, cuprous ferrocyanide is precipitated, and, therefore, that the hypothetical presence of cupric ferrocyanide is extremely improbable.

If the test be performed in the absence of ferrocyanide, the other conditions remaining the same, provided that the indicator be present in sufficient amount to form a double iodide of mercury and copper with the cuprous copper in the solution, then the red end-point occurs when the alkaline cyanide plus the zinc double cyanide plus ½ the cyanide occurring as cupric double cyanide plus the cuprous double cyanide have been neutralized, the remaining ½ of the cyanide being left unattacked as $CuCy_2$. In this case the red mercuric iodide precipitate occurs in the midst of a yellow precipitate of a double iodide of mercury and copper, which is formed when the cuprous copper is turned out of its combination with cyanide. If when the red precipitate is just formed ferrocyanide be added to the solution, the precipitate becomes white owing to the reaction of the ferrocyanide with the mercuric cuprous iodide,

$$6(HgI_2.2CuI) + 4K_4FeCy_6 = K_4FeCy_6.3Cu_4FeCy_6 + 6(HgI_2.2KI),$$

and at the same time the cupric cyanide is rendered amenable to the attack of mercuric chloride, so that an additional amount equal to ½ the $CuCy_2$ or ¼ of the original K_2CuCy_4 may be added before the red precipitate of mercuric iodide is again produced.

$$12CuCy_2 + 4K_4FeCy_6 + 6HgCl_2 = K_4FeCy_6.3Cu_4FeCy_6 + 6HgCy_2 + 12KCl + 6Cy_2.$$

In the absence of ferrocyanide, a copper cyanide solution containing sulphocyanide, and having had its protective alkali neutralized, when titrated with mercuric chloride gives a light yellow precipitate

*Paper read before the Institution of Mining and Metallurgy, London.

when the alkaline cyanide plus the zinc double cyanide plus ½ the cupric double cyanide has been neutralized with mercuric chloride. The precipitate appears to be a double sulphocyanide of mercury and cuprous copper. It does not form in the presence of ferrocyanide unless sufficient zinc be present to combine with the whole of the ferrocyanide. Instead of neutralizing the protective alkali it may be precipitated by the addition of sulphate of zinc, the excess of zinc sulphate not interfering with the reaction. The yellow precipitate when occurring in the presence of a white precipitate is best observed against a dead white background.

When a cyanide solution containing both cupric and cuprous double cyanides is acidified, the cuprous double cyanide forms hydrocyanic acid and cuprous cyanide, whereas the cupric double cyanide forms hydrocyanic acid and cupric cyanide, or if strongly acidified, hydrocyanic acid, cuprous cyanide and cyanogen. Titration of the acidified solution with permanganate is very tedious and difficult, for the cuprous cyanide is but slowly acted on. If, however, acidified permanganate is titrated with the solution, the reaction is perfectly sharp and definite, when the permanganate is strongly acidified, the reducing action of the solution being proportioned to the cuprous copper plus the cupric copper.

$$2KCuCy_2 + 3H_2SO_4 + O = K_2SO_4 + 2CuSO_4 + 4HCy + H_2O$$

$$2K_2CuCy_4 + 4H_2SO_4 + O = 2K_2SO_4 + 2CuSO_4 + 6HCy + Cy_2 + H_2O.$$

If the permanganate be very weakly acidified it is possible to obtain a reducing power equal to the cuprous copper plus twice the cupric copper, owing to the fact that the cyanogen set free from the cupric compound, instead of spontaneously decomposing, is oxidized by the permanganate.

$$2K_2CuCy_4 + 4H_2SO_4 + O_2 = 2K_2SO_4 + 2CuSO_4 + 6HCy + 2HCyO.$$

In general, however, with weakly acidified permanganate some of the cyanogen set free spontaneously decomposes, so that the result obtained is somewhat less than that indicated above. With a strongly acidified permanganate, 1 gm. copper oxidizes 0.50 gm. permanganate ($K_2Mn_2O_8$).

When the solution contains sulphocyanide, acidification causes the precipitation of cuprous sulphocyanide, both from the cuprous and from the cupric double cyanide.

$$2KCuCy_2 + 2H_2SO_4 + 2KSCy = 2CuSCy + 2K_2SO_4 + 4HCy$$

$$2K_2CuCy_4 + 3H_2SO_4 + 2KSCy = 2CuSCy + 3K_2SO_4 + 6HCy + Cy_2.$$

One gm. of copper precipitates 1.528 gm. KSCy. On titrating the acidified solution with permanganate, the whole of the copper and of the sulphocyanide are oxidized.

$$2CuSCy + O_7 + H_2O = 2CuSO_4 + 2HCy.$$

There is no difficulty in the titration, for the cuprous sulphocyanide is readily acted on by the permanganate. Practically the same result is obtained whether the solution be strongly or weakly acidified. If strongly acidified permanganate be titrated with the solution, practically the same result is again obtained. If the permanganate be weakly acidified, some of the cyanogen set free in forming CuSCy from the cupric double cyanide is oxidized by the permanganate, and the reducing power of the solution is consequently somewhat higher.

When a solution containing ferrocyanide is acidified, it might have been expected that both cupric and cuprous ferrocyanide would be precipitated. This, however, is not the case, the whole of the copper coming down as cuprous ferrocyanide.

$$12KCuCy_2 + 4K_4FeCy_6 + 12H_2SO_4 = 12K_2SO_4 + 24HCy + K_4FeCy_6.3Cu_4FeCy_6$$

$$12K_2CuCy_4 + 4K_4FeCy_6 + 18H_2SO_4 = 18K_2SO_4 + 36HCy + K_4FeCy_6.3Cu_4FeCy_6 + 6Cy_2.$$

Sometimes there is a slight oxidation of the cuprous ferrocyanide with the production of a trifling amount of cupric ferrocyanide. If the acidified solution be titrated with permanganate, a reducing power equivalent to the whole of the copper plus the ferrocyanide is obtained. The result is practically the same whether the solution is strongly or weakly acidified.

$$K_4FeCy_6.3Cu_4FeCy_6 + 4O_2 + 14H_2SO_4 = 12CuSO_4 + 2H_6Fe_2Cy_{12} + 8H_2O + 2K_2SO_4.$$

Sometimes there is a slight oxidation of the cuprous ferrocyanide with the production of a trifling amount of cupric ferrocyanide. If the acidified solution be titrated with permanganate, a reducing power equivalent to the whole of the copper plus the ferrocyanide is obtained. The result is practically the same whether the solution be strongly or weakly acidified.

$$K_4FeCy_6.3Cu_4FeCy_6 + 4O_2 + 14H_2SO_4 = 12CuSO_4 + 2H_6Fe_2Cy_{12} + 8H_2O + 2K_2SO_4.$$

If strongly acidified permanganate be titrated with the solution, the same reducing power is shown, but if the permanganate be only weakly acidified, the reducing power is somewhat higher owing to the oxidation of cyanogen. In the titration of the acidified solution with permanganate, the precipitate which was originally white or nearly white turns first to a dark purplish black, and then, on continuing the titration, becomes dark brown and finally a light yellowish brown, in which latter solution the first red tinge of the permanganate has to be noted. When permanganate is titrated with solution, after the removal of the red color of the permanganate, the solution remains of a yellowish brown or yellowish green color.

When both ferrocyanide and sulphocyanide are present in the solution which is acidified, the copper combines with the ferrocyanide in preference to the sulphocyanide, and if sufficient ferrocyanide be present no sulphocyanide is precipitated. The reducing power of the solution is equivalent to the total copper plus the sulphocyanide plus the ferrocyanide.

The following tests are based on the foregoing reactions, and have been elaborated from a study of the working cyanide solutions from several cyanide plants in Mexico treating gold and silver ores, which also contained more or less copper. The following solutions are required:

Standard solutions:

Silver nitrate, 13.05 gm. ($AgNO_3$) in 1 litre of water.

Mercuric chloride, 20.846 gm. $HgCl_2$ in 1 litre.

N/10 permanganate, 3.18 gm. $K_2Mn_2O_8$ in 1 litre.

Approximate solutions:

Sulphocyanide to approximately equal permanganate.

Zinc sulphate solution. 10% $ZnSO_4.7H_2O$.

N/10 ferrocyanide, 42.2 gm. $K_4FeCy_6.3H_2O$ per litre.

(1) Take 10 c.c. of solution. Add a small crystal of potassium iodide and a little soda solution and titrate with silver nitrate till there is a permanent yellowish cloudiness. Result = 'a' c.c.

This result represents potassium cyanide equivalent to the alkaline cyanide plus the zinc potassium cyanide.

(2) Dissolve a small crystal of potassium iodide in a few c.c. of water, and add 5 c.c. ferrocyanide solution and a pinch of bicarbonate of soda. To this add mercuric chloride solution drop by drop, till there is just a permanent red precipitate. A convenient amount of iodide is enough to combine with from 1 to 2 c.c. of the mercuric chloride solution. To this add 10 c.c. of the cyanide solution to be tested, and then titrate with mercuric chloride until there is a permanent reddish coloration. Result = 'b' c.c.

This result represents potassium cyanide equivalent to the alkaline cyanide plus the zinc potassium cyanide plus the cuprous potassium cyanide plus ¾ of the cupric potassium cyanide.

If silver be present there will be a lemon yellow coloration before the end-point, which will then appear of a deep orange color. If silver be present in large amount, the amount of cyanide combined with it must be calculated and deducted from the amount shown in the test above to get the true value of 'b.'

(3) Take 10 c.c. of the cyanide solution, add 20 c.c. sulphocyanide solution and 5 c.c. zinc sulphate solution. Titrate with mercuric chloride solution till the precipitate remains of a permanent faint yellow tinge. This is best seen by placing the vessel in which the titration is performed on a sheet of clean white paper. Result = 'c' c.c.

This result represents potassium cyanide equivalent to the alkaline cyanide plus the zinc potassium cyanide plus ½ of the cupric potassium cyanide.

(4) Acidify about 10 c.c. of water very strongly with sulphuric acid and cool. Then add 10 c.c. permanganate and titrate this with the cyanide solution. In the presence of ferro and sulphocyanides, at the end of the reaction when the pink color of the permanganate is removed the solution will remain of a brownish or greenish yellow color. Calculate the reducing power of 10 c.c. of solution in terms of permanganate. Let 10 c.c. of solution reduced = 'd' c.c. permanganate.

This result gives the amount of permanganate reduced by the sulphocyanide plus the ferrocyanide plus the whole of the copper.

Sulphides and organic matter, should they be present, must either be removed previous to testing, or estimated and allowed for.

(5) To 25 c.c. of solution add 5 c.c. ferrocyanide solution and acidify with H_2SO_4; then add 5 c.c. zinc sulphate solution and make up to 50 c.c. Shake up and filter through a dry filter. Titrate 20 c.c. of the filtrate with permanganate. Result = 'e' c.c.

This result gives the amount of permanganate reduced by the sulphocyanide alone. Then

Alkaline plus zinc double cyanide—

$$\text{Estimated as KCy} = \frac{a}{10}\ \%$$

Cupric double cyanide—

$$\text{Estimated as KCy} = \frac{c - a}{5}\ \%$$

Cuprous double cyanide—

$$\text{Estimated as Kg} = \frac{a + 2b - 3c}{20}\ \%$$

Potassium sulphocyanide—

$$\text{(KCyS)} = e \times 0.0162\%$$

Potassium ferrocyanide—

$$K_4FeCy_6.3H_2O = \left(d - \frac{2b - a - e}{2.6} - e\right) \times 0.422\%$$

$$\text{Total copper} = \frac{2b - a - c}{40.9}\%$$

In the tests given the results have all been determined on 10 c.c of solution. If convenient, a larger amount may, of course, be tested, the quantities of reagents added being increased and the factors for the results being decreased proportionally.

Weights of steel bridges may be estimated by the following formulas. The approximate weights of bridges of different types (up to 550 ft. spans) have been obtained from actual construction, and if there is any criticism to be made against them, it is that they are too close an approximation. The term 'hot metal bridge' applies to a structure having a solid buckle-plate floor system and sides sufficient to provide protection for river and other travel underneath during the transit of hot metal from furnaces to the mills, as practiced at Pittsburg.

1. Ordinary pin-connected through truss, open-floor system, single track, $W = 7.5L^2 + 500L$.
2. Do., double track, $W = 12L^2 + 1000L$.
3. Double track, through truss, pin-connected, solid-floor system of furnace sand; hot metal bridge, $W = 16L^2 + 2800L$.
4. Ordinary deck-plate girders, single track, open floor, $W = 10L^2 + 350L$.
5. Do., hot metal, $W = 12L^2 + 1500L$.

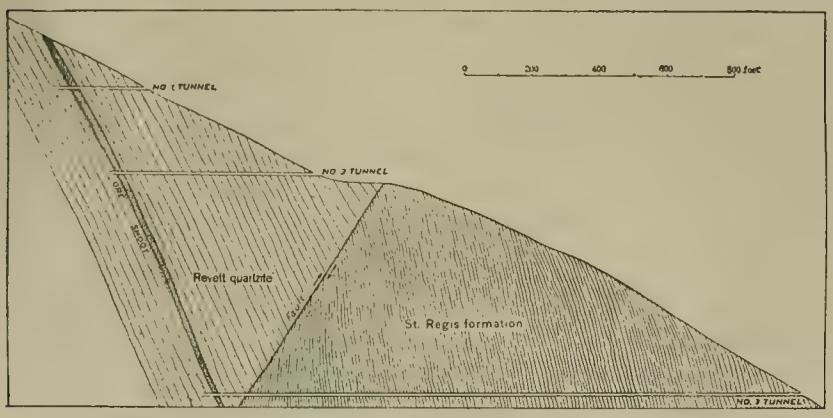
Where W = total weight of steel work in pounds and L = extreme length in feet.

The design is based on a live load similar to Cooper's class E 50, but with particularly heavy loads on cars suitable for hauling molten metal.—Proceedings of the Engineers' Society of Western Pennsylvania.

SNOWSTORM COPPER DEPOSIT.

*What is commonly referred to as the copper belt of the Coeur d'Alene district, Idaho, is an area not susceptible to precise delimitation, but which lies east of a meridian through Stevens peak and south of Canyon creek, thus being in the southeast corner of the district. How far south it extends is not known. Within this belt are one productive mine, the Snowstorm, and several prospects. In 1904 the Snowstorm had produced about $60,000. In 1906 the production had risen to 82,679 tons for the year, with a gross value of $1,069,324. The improvements in 1905 and 1906 cost $152,350, and the net profits amounted to $150,000.

The deposit of the Snowstorm mine consists of disseminations of bornite, chalcocite, and chalcopyrite in certain beds of the Revett quartzite. The greater part of the sulphides, however, has been oxidized to cuprite and malachite. The various prospects are on metasomatic fissure veins carrying chalcopyrite, chalcocite, or bornite, with quartz, dolomite, or siderite.



Cross-Section of the Snowstorm Deposit.

The Snowstorm mine, which has lately come into prominence as the only producer of copper ore in the district, is situated near the head of Daisy gulch, 3½ miles east-northeast from Mullan, the principal adit being at an elevation of approximately 5100 ft. Work on this property began in November, 1903, and at the time of visit the mine had been well opened for stoping and was connected with the railway at the mouth of the gulch by a Riblet aerial tramway. A leaching-mill was also in process of construction at the lower terminus of the tramway. The total production of the mine in August, 1904, amounted to about $60,000, practically all from development work. The mine, except the lower tunnel, which is not yet producing ore, was then worked by lessees, who had constructed the tramway.

The leaching-mill has since been successfully operated, the process being reported as follows:†

"An extraction of about 97% is said to be obtained at the Snowstorm mill at Larson, Idaho, where a copper carbonate ore is being treated. After crushing, the ore is run into agitators, where it is mixed with a 10% solution of sulphuric acid and a solution of chloride of lime. Thus a solution of copper sulphate is formed, while the silver remains as a precipitate of chloride. From these agitators, which are three in number, the copper sulphate solution goes through a series of six settling vats. From the solution, the copper is precipitated with scrap-iron, and the residues, containing the silver chloride, are treated with sodium thiosulphate. The solution of silver thiosulphate thus obtained is passed through settling-vats, and the silver is precipitated from the clear solution by sodium sulphide, the precipitate being filtered and shipped for refinement. The ore runs from 2½ to 3½% copper and about 7 oz. silver."

The mine is opened by three tunnels, which crosscut northeast to the ore. The middle or No. 2 tunnel is the most important, and is the one from which ore is being shipped. No. 3 tunnel has reached the lode, which has been explored for about 400 ft. on this level. No workable bodies of ore had been found in this tunnel, however, at the time of visit.

The lode is a zone of impregnation which embraces one or more beds of the Revett quartzite, and conforms to the bedding of the rocks in which it lies. It strikes N.60°W. and dips to the southwest at an angle of 65°. In some places the zone of mineralization is 40 ft. wide. There is apparently no lithological difference between the quartzite that carries the ore and that which forms the country rock. Neither is there any pronounced or persistent fissuring along the lode, such as might be supposed to have determined ore deposition in its vicinity. The ore occurs impregnating the aparently unfissured quartzite, and along joints and small irregular fractures. Microscopic study shows, however, that the quartzite has been crushed and that it is traversed by a network of microscopic fractures. These capillary openings, invisible to the unaided eye, gave access to the ore-bearing solutions. The deposit as a rule has no definite walls, although the ore is locally limited by bedding planes in the quartzite.

All the upper workings are in the Revett quartzite. No. 3 tunnel, however, enters in the slaty rocks of the St. Regis formation. About 100 ft. south of the lode this tunnel passes through a well-defined fault-breccia into the Revett quartzite. As the St. Regis is stratigraphically above the Revett, the fault is clearly a reverse or thrust fault. The throw is unknown, but can not be less than 700 ft. The fault must cut the ore-bearing zone only a short distance below the tunnel. The fault shows no mineralization and contains about 10 ft. of clay gouge. These facts would ordinarily be taken to indicate that the fault is later than the ore. In this district, however, such

*Abstract from Professional Paper 62, U. S. Geological Survey. By F. L. Ransome and F. C. Calkins.

†MINING AND SCIENTIFIC PRESS, June 22, 1907, p. 782.

a conclusion can not safely be drawn, and the relative age of fault and ore must remain for the present undetermined. In any event it is unlikely that the present orebody can be followed for much more than 100 ft. below No. 3 tunnel.

In No. 2 tunnel the ore-shoot is at least 500 ft. long, although the ore in the faces of the drift at the time of visit was of low grade. In No. 3 tunnel, as already mentioned, no orebodies of commercial importance have yet been found.

In its unoxidized form the best ore consists of quartzite so crowded with little specks and small irregular bunches of bornite, chalcocite, and chalcopyrite as to be dark gray or nearly black. The microscope shows that the ore-minerals to some extent fill irregular microscopic fissures, but that for the most part they have replaced the interstitial sericite and siderite of the country quartzite.

Comparatively little of the ore, however, remains in its sulphide condition. Most of it has been oxidized to cuprite and malachite. There is no well-defined zone of oxidation, most of the sulphide ore occurring in No. 2 tunnel, and some carbonate in No. 3 tunnel. The latter tunnel is very wet, a large flow of water having been encountered as soon as the quartzite was cut. This water, however, evidently comes from the surfaces of the neighboring ridges and is oxidizing in its character. It is held in all the fissures in the brittle quartzite and is dammed on the southwest by the clay gouge of the fault.

The average tenor of the ore, as shipped in 1904, was 4% copper, with about 6 oz. silver and 0.1 oz. gold per ton. One carload shipped carried 12½% copper and 15 oz. silver, no returns being made for gold. Another shipment contained 8.7% of copper, 13½ oz. silver, and $2.60 in gold, per ton. Most of the ore at the time of visit was being shipped to Butte, in accordance with a stipulation that the silica should not fall below 90 per cent.

TABLE OF ALASKAN ALLUVIAL MEASURES.

1 pan holds	25 pounds of gravel.
6 pans	1 cubic foot.
15 pans	1 wheelbarrow.
10 wheelbarrows	1 cubic yard.
135 pans	1 cubic yard.
4 wheelbarrows	1 bucket.

These do not agree exactly. A full pan will hold from 20 to 25 lb., and it requires from 125 to 135 pans to make a cubic yard. A cubic yard is usually estimated to weigh 3000 lb., or 1½ tons. If a pan holds 20 lb. and 150 pans equal a yard, then a cubic yard weighs 3000 pounds. A loaded wheelbarrow will hold one-tenth of a cubic yard; this is the ratio recognized at Fairbanks.

By the use of fuel-oil the management of the Alaska Treadwell mine has reduced the cost of steam power more than $50,000 in six months. The cost, using coal, was $125,021 from October 15, 1906, to May 15, 1907, while from October 15, 1907, to May 15, 1908, the cost, using oil, was $74,262. The total cost of the installation has been $28,680 to date.

NORTHERN TERMS.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Each mining region has its own local terms, originating from the inter-play of peculiar men and peculiar conditions. Some of these terms are expressive; indeed, they may be so expressive as to become a necessary part of a telling description. Other terms by their wide applicability become serviceable in regions beyond the place of their birth and pass into the linguistic heritage of our race. Others again are merely the vulgarisms of the moment or the provincialisms of uneducated men, and the sooner they are thrown over the scrap-heap the better.

Owing to the unusual climatic and geologic conditions of the North, the traveler to the Yukon and Alaska will hear many terms strange to him. Some of these are vivid. For instance, the country beyond the coast range and within the heart of the wilderness, is called 'the inside,' as distinguished from the rest of the world, which to the dwellers at Dawson or Fairbanks is 'the outside.' In southeastern Alaska they have even finer distinctions; anyone going from Juneau to Seattle or to San Francisco goes 'below,' while should he sail for Seward or Valdez he leaves for 'the westward'; so that the 'inside,' 'the outside,' 'the westward,' and 'below' have meanings in which are hinted the migratory habits of a frontier people.

The arctic moss that carpets the frozen face of the northern wild is called 'tundra.' It is a Russian word and came from Siberia. Against one word I rebel, in vain; namely, 'muck.' The dirty blanket of frozen mould that covers the face of the arctic North is called 'muck.' Under a few inches of dull green moss there is a thickness, varying according to locality and exposure, of ice, in which are embedded fragments of roots, moss, mould, and rock débris. In a temperate climate this would mean a layer of soil; in the North, it means a much greater thickness of black ice, which thaws to a liquid mud. Fully 60% of the 'muck' is water, the remainder is mostly organic material that is light enough to float. It is present everywhere; and as it is ubiquitous in the topography so it is also omnipresent in speech. There is no synonym to replace 'muck'; 'mud' will not do, for it is not mud; 'mud' is moistened earth; 'loam,' 'soil,' 'mould,' and the like do not express the frozen condition. It is true 'muck' signifies nothing to those who have not been in the North, but to a 'sour dough' or old timer, it has a world of meaning, for it is the one great natural obstacle against which he has fought time and again. 'Muck' has come to stay, simply because there is no substitute available.

'Sour dough' and 'cheechako' are complementary. 'Sour dough' is the emblem of the seasoned frontiersman. Being unable to procure yeast, the prospector or woodsman carries a little can filled with soured dough-batter; with this and by the addition of a little baking soda, he starts the leavening of his

bread, in the form of pancakes, or 'flapjacks.' The men of the North will allow the lump of sour dough to freeze and as the stock is diminished they add flour and water, mixing the mass, so that it performs for them the function of yeast. 'Cheechako' or 'chichaco' is probably of Kanaka origin. 'Chi' or 'chee' means 'new' and 'chaco' or 'chako' means 'to come'; a 'cheechako' is a newcomer. The term corresponds to 'tenderfoot' in the West and 'new chum' in Australia. It is a word from the Chinook language, a jargon composed of derelicts from English, French, Indian, and Kanaka. Long before the Russian or the American controlled Alaska, there was trade between the Indians of the Pacific coast and the islanders in the South Seas. But that is another story.

'Mush' and 'musher' are distinctively Alaskan. They are Chinook words of French origin, for there is good reason to believe that they were corrupted from *marcher* and *marcheur*. These words are an inheritance from the old *voyageurs* who came north up the Mississippi and westward from Quebec into the Northwest. A 'musher' now means a wandering prospector. The dogs are told to 'mush,' and the mothers of the North tell their children to 'mush on'. The last is probably a corruption of *marchons*.

The men who undertake to work a claim on a royalty, paying the owner a fixed proportion of the gold obtained, are called 'lay-men,' and they are said to have a 'lay'. This term must have been borrowed from the whalers, for in the whaling business every member of the crew receives a share of the profits, called 'lays'. In Cornwall lay-men would be called 'tributers'; in Nevada they are called 'leasers', and they ought to be termed 'lessees'.

Next we come to technical terms. A river is said to have a right and left 'limit'; here 'limit' corresponds to bank or border. The right limit is on the right going down-stream. The width of gold-bearing gravel rich enough to be mined is called the 'streak'; this is an abbreviation from 'pay-streak'. It should be further abbreviated, namely, obliterated. 'Streak' is not descriptive, to say the least, for the gold-bearing gravel may exist as a deposit half a mile wide, and even when smaller there is no connotation of narrowness. In vein mining the 'pay-streak' is the width, usually small, in a large lode, that is rich enough to be mined; thus a lode 6 ft. wide may have a pay-streak 2 ft. wide, the other 4 ft. being discarded. A 'streak' is a thin vertical layer, as a 'seam' is a thin horizontal stratum. The gold-bearing silt that constitutes the 'streak' of the Alaskan is from a few inches to a few feet thick and it lies on the creek-bottom like a broad ribbon, the width of which may range from a few feet to a thousand feet or more. The word 'streak' suggests none of these characteristics. It would have been better if the first half of 'pay-streak' had been retained, for 'the pay' has some significance in gravel mining. In Australia the central and rich portion of an alluvial channel is called the 'gutter,' but this term does not commend itself. For 'streak' in its Northern significance we have many synonyms, such as the 'channel', 'gold-bearing gravel', 'pay-gravel'. It is a relatively thin layer of rich material lying upon the creek bottom, under an overburden of valueless gravel, débris, and muck.

In the 'drift' mines the terminology is woefully confused. 'Drifting', as a word to describe the driving of galleries along the bedrock of an alluvial deposit, is an old term borrowed from California. It has won a firm place in technical literature, but underground on Esther creek or on Cleary you will hear curious applications of terms. Thus the main drift will be referred to as a 'tunnel', the excavation or stope will be labeled a 'drift', and you will hear of the danger of losing the 'face' by reason of a cave. A 'tunnel', properly defined, is an opening from daylight to daylight, as in railroad engineering. 'Drift-mining' depends essentially on the digging of 'drifts' in a gravel deposit, therefore 'tunnel' is particularly out of place. The stope or excavation made along the bedrock to a height of six or seven feet may well be called a 'room', borrowing an expressive term from the coal miner. It seems a needless risk of confusion to call this excavation a 'drift' in a 'drift' mine which is opened up by 'drifts'. Words gain in utility by being given specific duties.

The miners at Dawson will talk about "false bedrock"; indeed, I have heard engineers use this term. Bedrock is bedrock; what is meant by the above quoted localism is 'false bottom'. In gravel mining the gold may lie on a layer of clay or sediment at some distance above the true rock surface on which the whole alluvial deposit lies; such a sub-stratum is called a 'false bottom' because it serves as a 'bottom' on which the gold is spread, and a 'false' one, as compared to the real basement of the gold-bearing deposit. 'Bedrock' and 'false bottom' are complementary terms. The drilling of a series of holes across an alluvial deposit is called 'cross-cutting'. This term has a prescribed use in vein mining, and it seems a pity to twist it to a new duty, for which it is not adapted.

The first claim on which gold is found on any creek is called the discovery claim, or briefly, 'Discovery'. Other claims located subsequently are numbered according to their relative position above or below the discovery claim, so that the third claim down-stream is called No. 3 Below Discovery, and the tenth claim up-stream from the discovery claim is called No. 10 Above Discovery. The claims in the Yukon now extend for 500 ft. along the course of the creek; formerly they were smaller. In Alaska they are usually 1320 ft. lengthwise along the creek and 660 ft. across, making 20 acres. Hence the number in the name of a claim will give an idea of its relative position, although the accuracy of the deduction is apt to be spoiled by the existence of intermediate fractional claims. If the discovery is made at the point where a branch creek joins a main valley, there will be no claims below 'Discovery'. Thus we speak of "No. 5 El Dorado".

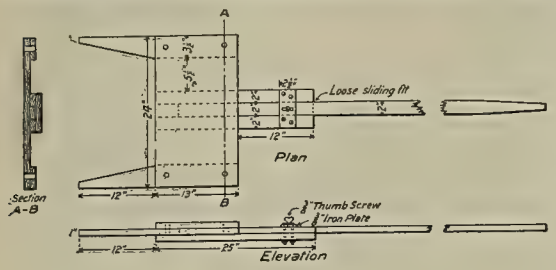
'Frost' is used to designate frozen ground; thus, the drift miner thaws "the frost" and the dredge superintendent bucks against "the frost", especially if he is reckless. Mining in the North is the conquest of "the frost".

MINE SAMPLING DEVICES.

By Harley E. Hooper.

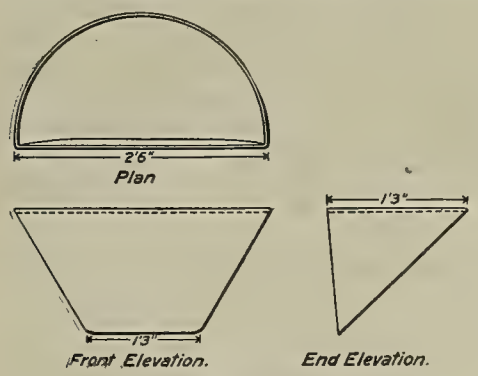
*The two devices herewith described have been frequently used by me when engaged in mine sampling, and as they have proved great conveniences, a brief account of them may be of use to other mining engineers.

Sampling Chair.—This is a form of the old hanging chair modified to ensure greater stability, and



Chair for Sampling.

to allow the operator to work in hard ground with both hands. The projecting arm at the back of the seat may be made of any length to suit the winze requiring sampling, or a new one may be made in a few minutes at any mine when the winze to be sampled happens to be of an odd size. Four short ropes, attached in the usual way to the seat, are made fast to the windlass cable. With the thumb-screw slacked and the tail-piece well in, the sampler is lowered



Bag for Sampling.

until the desired position is reached; he then works himself close up to the face by pushing the tail-piece out with one hand and using the thumb-screw with the other. The two forward projections may be dispensed with, if not desired.

Catching Bag.—This was used for some time apart from the 'chair' for sampling high up the steep face of a stope, or at the back of a wet drift, under which a cloth could not be laid. It consists of a semi-circular hoop of ⅜-in. round iron, to which a canvas bag is carefully sewn so that it falls vertically from the straight edge of the hoop. The stitching should be done carefully round the bottom edge, and if any doubt exists as to any of the sample being retained in the bag, it may be used with the reverse side each time. The semi-circular side will be found convenient for getting into ordinary depressions, and the straight side for regular faces, while for acute depressions the corners can be used. In general mine sampling this device will be found invaluable. Using it in conjunction with the chair, a raw-hide belt lace is attached to the middle of the curved side of the bag and to the rope about 3 ft. above the chair. This holds the bag horizontal while the inner edge is resting on the sampler's knees. The bag may also be used to hold moils, hammer, etc., and when the operator desires to ascend he simply pushes it off his knees, when, from its shape, it hangs closed up. With an acetylene bicycle-lamp suspended under the left arm by a strap over the right shoulder, I have sampled numbers of winzes rapidly, accurately, and cheaply with the above devices. A bicycle-lamp I find to be preferable to the regulation acetylene mine-lamp for this work.

*Abstracted from proceedings of the Institution of Mining and Metallurgy, London.

The septic tank, for treatment of sewage, is a comparatively recent development, and was introduced about the same time by two experimenters working absolutely independently, one at Champaign, Illinois, and the other at Exeter, England. It is, in effect, a sedimentation basin, so designed and operated as to lessen the sludge deposit by dissolving a portion of it and by reducing another portion to gaseous form. This reduction or hydrolysis of the sludge is brought about by anaerobic bacteria, which work in the absence of air and are thus directly opposed in character to the aerobic bacteria or nitrifying organism of sewage farms, intermittent filters, contact beds, and percolating filters. Since inorganic matter is not acted upon by the bacteria, its exclusion from the septic tank is desirable. To this end, small grit chambers are provided, through which the sewage passes on its way to the septic tank, and in which the sand and other mineral matter sink because of their greater specific gravity. The inlet and outlet of the septic tank proper is usually submerged, since in the presence of air the anaerobic bacteria would be replaced by aerobic. The tanks are made long and narrow, thus affording time for sedimentation, and have a sewage depth of from 6 to 9 ft. The best form is probably an underground or partly underground, air-tight, light-tight, concrete chamber, large enough to hold approximately one day's sewage flow. It should be provided with baffle-boards, so that the velocity of the current is small. The sludge collecting in the tank must be removed occasionally. The effluent from a properly constructed tank may be discharged with impunity into any stream not used as a source of water supply. A septic tank should make an ideal system of disposal for a small town or community having a limited water supply and no natural water-course into which raw sewage can be discharged.

The largest concrete arch in the world has just been opened to traffic at Philadelphia. The span of the main arch is 233 ft. and the rise is 70 ft. 3 in. Although the arch rings are of plain concrete, steel floor beams are used in places, and also minor reinforcement to guard against internal stresses.

HOSTOTIPAQUILLO AND THE LERMA RIVER.

Written for the MINING AND SCIENTIFIC PRESS
By EZEQUIEL ORDOÑEZ

In view of the geological features and the great extent of the veins, Hostotipaquillo is one of the most important localities in the western Sierra Madre, Mexico. It lies within the District of Tequila of the State of Jalisco, in a mountainous region that is cut by the canyon of the river Santiago or norhtwest of Guadalajara to Hostotipaquillo, has excavated its own bed, almost at the southern foot of a group of mountain ranges running northwest and appearing to terminate in the central plateau. Only a few of these ranges seem to be continuous farther south, and therefore the Sierra Madre presents different widths to the north and south of that river in the District of Tequila. The width of the Sierra Madre is so far reduced to the south of the river that if it were not for the northwest prolonga-

The State of Jalisco, Mexico.

Lerma, and is therefore in the region of high mesas, deeply carved by tremendous erosion. In no part of the country can one better appreciate the true physiographic character of the western Sierra Madre. The plateau has been the result of the piling of volcanic material upon an ancient land surface. There is now a marked difference in the two sides along one portion of the canyon. The south side, which belongs to the central plateau, is 3400 ft. above sea-level, while the opposite side, which belongs to the Sierra Madre, presents elevations that almost reach 6500 ft. above the sea, but on the plateau, long sierras rising above the plains reach and even exceed that elevation. The Santiago river, from the tion of the Etzatlan ranges and the great barranca de Mochiltictic, the Sierra Madre would be interrupted near the parallel of 21° 30′ north latitude, to re-appear subsequently farther south and with greater vigor in the regions of Pigintos and Mascota. If that interruption had been established there would have been a convenient pass in central Mexico to reach the Pacific coast, by only crossing a series of high tablelands from Guadalajara to Tepic.

The Cananea, Rio Yaqua & Pacific railway, which will shortly connect the Mexican Pacific coast with the great central plateau, by way of Tepic and Guadalajara, has encountered great difficulties in running through the narrow pass in the Sierra Madre

to the northwest of Etzatlan. Although the final route through that region has not yet been decided, it is important to notice that the railroad will not pass far from the town of Hostotipaquillo. It is said by railroad men that a line to cross the ranges and the barranca will require many bridges and viaducts, which in the aggregate will amount to one and a half miles, as well as several tunnels aggregating about the same length. It is well known that the western support of the great central plateau of Mexico is essentially eruptive in character, and that the mineral resources of that region have been exposed by deep erosion, because the high western edge of the central plateau was first covered with rhyolites and dacites that formed high mesas overlying the veins. These veins, which run through the underlying andesites, diorites, and Tertiary granites, would never have been revealed if there had not been carried off toward the coast a formidable volume of the acidic younger material that composed the marginal mesas. At present these mesas in the Sierra Madre are broken in every direction by deep ravines in which numerous veins appear.

The Santiago river is one of the most important in Mexico, with a length of nearly 1200 kilometres, having its rise in the eastern corner of the high valley of Toluca from several springs that together form the muddy lakes of Lerma and Almoloya. This river bears the name of Lerma to the point where it discharges into lake Chapala, at about the middle of its course. Chapala was, in former times, a wide valley drained by the river, but at the beginning of the Recent era, a barrier of basaltic lava converted the valley into a large basin. After that the basin was broken by erosion, restoring the river to the ancient channel on its way to the ocean. In cutting its way through the Sierra Madre, the Santiago river exposed a mineral territory not less than 30 miles long in the neighborhood of Hostotipaquillo, the outcrop of veins ribbing the mountains in their slope to the river bed. In all this large territory are distributed the groups of mines called La Cobriza, Cinco-minas, Santo Domingo, San Pedro Analco, Mina Grande, Quebradilla, as well as those of El Favor, San José, San Francisco, Cabrera, La Castellana, Refugio, Jora Vieja, and others not situated on independent groups of veins. The mineral system is seen to extend without interruption where erosion has already washed away the overlying strata newer than the veins. In this same region, and at short distances apart, are other famous mining districts, such as La Yesca, Bolaños, which, like some of the former, belong to a different political division. The town of Hostotipaquillo, the chief seat of the municipality, is outside of the mining area, as it is situated on the edge of the central plateau where it descends into the canyon. The geological structure of the Sierra Madre and of the central plateau is clearly and simply exhibited in this region. It is seen that the central plateau owes its elevation, as is well known, to the successive heapings of volcanic rocks upon older eroded lands. In this connection, any one could view a beautiful landscape from any of the high peaks that lift their heads about the right border of the Santiago canyon north of Hostotipaquillo. A trip to this region for this sole purpose would be worth the trouble. From a great height, supported by uniform steep slopes, the geologist contemplates, over the horizontal line of the plains that form the central plateau, the volcano of Tequila with a great lava mass crowning its summit. The immense cone of this high volcano appears to repose on a large platform of lava, which is bathed by the waters of the Magdalena lake. The nature of the ground is as suggestive as the landscape; rhyolites and dacites are the constituents of the mesas, and on such material rests the entire volcano of Tequila. These rocks lie on the Miocene andesites, which are distributed through granites and diorites. In these andesites are found the veins along the lower level near the river and in the high hills in the neighborhood. The mountains are also frequently crowned by remnants of rhyolite mesas in the form of bluffs. In the steep walls of the canyon are found blocks of columnar basalt in the form of cliffs and cornices; these are the remains of a basaltic plain over which the present river flowed, 1200 ft. above its present bed, and for a distance of no less than 50 miles.

The Rio Grande de Santiago has three times reexcavated its own bed in its passage through the Sierra Madre. The river first started by flowing through a large valley bounded by mountains of eruptive rock, because it must be stated that the rhyolites that formed the mesas did not spread over prolonged andesitic sierras, but over independent *massifs* close to each other, each with its own history of volcanic evolution, although many of the *massifs* were synchronous. The Miocene valley became continually deeper by erosion, and by displacements due to faults along the dikes so numerous in the mining district of Hostotipaquillo. In the Pliocene era, the great overflow of rhyolite constituting the mesas, filled the basin of the rivers and interrupted the course of the waters, which soon commenced to run again over the mesas, filled up the basin of the river and interrupted the course of the waters. These soon commenced to run again over the mesas as well as underground, following their old channel. Near the coast, the river precipitates itself in falls and rapids, which continually work backward, as has been done in the east by the falls of Juanacatlan on the same river near Guadalajara. This waterfall, called the Niagara of Mexico, exists where the great stream ceases to serve agricultural uses and is converted into a source of motive power. The backward erosion of the waters, assisted by movements in block, have ended by re-establishing the old river bed, for the second time, in the form of a gorge with cliffs, afterward becoming gentle slopes. Lastly, this old valley has become the scene of a new geologic change. The uniform slope of the bottom favored the flow of a stream of basaltic lava many miles long and 100 to 300 ft. thick. The erosion cut through and brought down these basaltic masses, allowing the river to return to its old bed. This third period of erosion in the Pleistocene and Recent eras, appears to have been more intense and

prolonged than the two earlier, seeing that after the waters reached their former bed, they have continued their work of excavation, so that it is now 1000 ft. lower. The photographs given herewith will afford an idea of the different phases of this cycle of geologic and physiographic changes.

In this brief history of the Rio Grande de Santiago no mention has been made of the period in which the veins were formed; this probably was immediately before the appearance of the rhyolites forming the mesas. Nor has mention been made of the phenomena connected with the appearance of the dikes, some of which are older and some newer than the veins, nor of the fluctuations of surface-elevation on a large scale in the Sierra Madre.

The mining region of Hostotipaquillo has been worked ever since the commencement of the colonial

C-D. Second River Bed on Basalt.
A-B. Oldest River Bed.
E-F. Present Channel of River.

period, in spite of the rough character of the ground, of the vicinity of warlike Indians in earlier days, and of the entire absence of roads. The last mentioned difficulty exists even at the present time. In the year 1804, Humboldt refers to the Hostotipaquillo mines as celebrated, and in the reports presented by the Mining Deputation of Hostotipaquillo to the Provincial Mining Board, in 1824, ample data with respect to the old mines denominated La Famosa, Deseada, El Refugio, Mololoha, El Tabor, La Espada, San José, Quebradilla, Mina Grande, and others were given. Some of these old mines are now undergoing development with large capital in the hands of companies, mostly American.

A complete list of all the companies now contributing to the activity of the district cannot be given, but several are worthy of special mention. The Cinco Minas property, belonging to Martinez and Cardenas, has under development four or five mines. The property represents an approximate value of ₱500,000. Part of the ores from the Cinco Minas are treated in the Hacienda de Santo Tomas by the patio process. The El Favor Mining Co. operates an extensive property, of which the El Favor mine is the chief. Some of these mines show ore to the value of several million pesos. The Company is planning the erection of a large concentration and cyanide plant in which it will treat its abundant supply of low-grade ores. It will utilize a part of the water-power to be developed by the plant of the San Pedro Analco Co. The Cabrera group of mines belonging to the Virginia Mining & Milling Co., has been producing from the Cabrera mine for many years. The Com-

Rio Grande de Santiago.

pany is now erecting a concentration and cyanide plant to have a daily capacity of 200 tons, and will obtain power from Santiago river. The mill will be erected close to the river bank, and the ores will be brought down from the mines by a cable tramway. The San Antonio Mining Co. is operating the San José, Las Palomas, San Antonio, and other mines. It is also operating the small Socorro mill, which is one of the oldest in the district. The San Antonio mill has 10 stamps, partly driven by electricity. The process employed is the patio, and the tailing is concentrated in the old Mexican way. The Jalisco Mining Co. has the Mercedes, Doña Ema, and other mines close to the old Mololoha and Hundido mines. Work is being pushed by an American company in the famous Casados mine. The exploratory work recently started has led to the discovery of a large quantity of ore. The Company is erecting a concentration and cyanide mill, besides exporting high-grade ore. The San Felipe Mining Co. operates

a mine near the village of Jocotlan. It also possesses a small concentration and cyanide plant, which is equipped with stamps, Bryan mills, and other modern machinery. The Santo Domingo Mining Co. has operated an extensive group of mines, and completed considerable development work with the help of machinery. The principal mines operated by this Company are the Santo Domingo, Esperanza, Nombre de Dios, and El Favor. It is said that the Company has temporarily suspended work. The Castellana mines have for some years past been worked successfully with English capital. They now have a mill, driven by electric power, with a capacity of 40 tons per day. This Company utilizes a small part of the waters of the Santiago river for motive power. The Cia. Minera de San Pedro Analco operates an important group of mines on the right bank of the Santiago with satisfactory results. Some of the mines in this group are considerably developed. The San Pedro mill has six stamp-batteries which crush 60 tons per day. The ores are treated by the patio process, although with rather high losses of silver.

As a general thing all the mills in the Hostotipaquillo district which treat the ores by the patio process give poor returns, as these ores are not adapted to that treatment. The cyanide process will give better results supplemented by concentration. The San Pedro Analco Co. has undertaken an important work in the construction of a dam 300 ft. long across the bed of the Santiago river, creating a fall of about 25 ft. Three turbines will be set up to handle a large volume of water and develop 1500 hp. in an electric plant. The construction of this dam across the river reflects great credit on the builders and on the company. They have had to overcome enormous difficulties and incur heavy expenses. When the power plant has been installed, the San Pedro Analco Co. will re-construct its mill in accordance with modern principles.

Carlos Romero, of Eztatlan, Jalisco, is the owner of an important group of historic mines, such as Albarradon, La Famosa, Deseada, La Espada, La Quebradilla, La Descubridora, and others. He was formerly the owner of the Mololoha mine, which is famous in local history. The mining region of Hostotipaquillo already involves a valuation of nearly ₱35,000,000.

The veins in this region traverse andesite, dacite, and seldom diorite, and it is not a rare thing to find the veins also in breccia and in andesitic tuff. As a general rule, the veins are wide and continuous, especially in the eastern parts of the district, where veins are found with a width of 34 ft. The matrix is quartz and calcite. Large bonanzas were found in the old mines, but the dissemination of the ore throughout the veins gives this district special importance. Its future depends on the utilization of concentration and cyanidation. As a general rule, the ores carry little gold, the most valuable mineral being silver sulphide, sometimes accompanied by galena, pyrite, and blende. There are also small quantities of copper ore, carbonate near the surface, and chalcopyrite below. In the oxidized zone, where secondary modifications have taken place, the veins contain manganese, oxides, ferruginous clays, native silver, and in some cases, chlorides and bromides of silver. Practically the deposits form a series of linked veins running northwest, following the general orogenic axis of the region. The veins are frequently intersected by faults, but displacements are not great; they are also cut by dikes. The veins sometimes follow the direction of the older dikes for a long distance.

The enormous extent of the Hostotipaquillo mining region, the number and width of its veins, the abundance of its low-grade ores, the facilities afforded by the topography, the abundant natural resources, the completion of the railroad, will make Hostotipaquillo one of the most important mining districts of Mexico. For motive power, the Santiago river offers immense possibilities. It is reported that the Federal Government has given concessions for about 200,000 hp. to be developed along this stream.

Concerning the source of ground-waters in California, W. C. Mendenhall, of the U. S. Geological Survey, says: "The statement has frequently been made that the underground waters are just as dependent as the surface run-off on precipitation within the local contributing drainage basins, but the tenacity of the oft-asserted belief that these subterranean reservoirs have some other source than local rainfall makes it desirable to repeat the statement with emphasis. Each of the important subterranean basins in southern California is supplied exclusively by the water that falls upon its surface or that flows into it through some tributary stream. Any other hypothesis, as, for example, that the waters from the distant Sierra, or the Colorado river or the Pacific Ocean, may, by underground channels or by seepage, reach the San Gabriel valley or the Pomona neighborhood, is erroneous, and conclusions based on it are wrong and lead to a false policy in the utilization of the ground-waters."

San Martin is the name given to a remarkable pass through the Andes discovered two years ago, and through which a railroad is now building. The Chilean Trans-Andean road, which has been under construction for several years, will use the Uspallata pass, at an altitude of 13,000 ft., 300 miles north of the San Martin, which is only 2375 ft. high. The railroad through the latter will enable the run from ocean to ocean to be made in 30 hr., and the vast freightage now taken around the Horn can be sent through by rail on an easy grade that follows a chain of picturesque and rock-walled mountain lakes never before known to the world. Between two of the lakes there is a 200-ft. waterfall, capable of producing electric power sufficient to operate 300 miles of the road.

In the deep alluvial mines of Victoria trouble is experienced during periods of falling barometer from the escape of gas from the gravel. To obviate this, air-locks are used. By blowing air behind the doors the pressure is increased, so that the gas does not flow out of the gravel.

THE GASTEROPOD PRINCIPLE.

By James F. Kemp.

*For several years past I have been accustomed to expound to the Journal Club at its annual dinner certain aspects of that all absorbing scientific theme, the origin of ore deposits. Both by constant iteration and by the actual demonstration of working processes before your eyes, ore deposits have now been so positively shown to be dependent upon igneous phenomena, that I have become deadly weary of the whole business, and I realize that my own feelings are merely a faint echo of yours. Therefore I mean to get as far away from them tonight as possible and to discuss a subject that has nothing whatever to do with them.

We all know that in the teachings of paleontology there is one ever-green and never-failing solace for the weary worker in other fields, and although I have only been a cultivator of this branch 'on the side,' so to speak, like the extra lump of sugar in the saucer of the cup of coffee in the restaurant, yet I have for years been pondering one of its profounder problems. Really quite unknown to the membership of the department, there have been two specialists in the gasteropoda among us, instead of one, as you have supposed. Investigation of this problem, the gasteropod principle, has carried me into fields never dreamed of at the outset, and while, like yourselves, I knew it pervaded Professor Grabau from the crown of his head to the sole of his feet, yet I find in addition that it is one of the all-pervasive principles of the universe. In fact, it is the one that manifested itself, almost as soon as there was any universe at all.

First, then, what is a gasteropod; and, second, what is the principle?

On looking up the French word for gasteropod in the dictionary of Messieurs Spiers et Surrenne, I found this definition:

"*Gastèropodes.* Reptiles that creep on their belly."

From this definition we see that the great gasteropod group embraces the reptiles as well as that portion of the molluscs with which we have usually associated it, and in order that it should embrace the rest of the animal kingdom, all we need is a few more dictionaries. Gasteropods therefore have the possibility of becoming synonymous with the animal kingdom itself, and as exponents of expansion they outclass even the imperialists of our own times and country.

But before this comprehensive conception is reached, let me hasten to set forth the fundamental principle of the gasteropoda, which is the coil or twist that in a greater or less degree runs through them all and is distinctive of them. The gasteropod principle is therefore that one in accordance with which things animate and inanimate develop a twist or whirl or coil.

We find it first exhibited in the nebulas with which since the days of Laplace we have been taught to believe the solar system began. To be sure, there are certain moderns who have tried to upset this bit of folk-lore, notably one iconoclast, T. C. Chamberlin, the planetesimalist of Chicago, but we simply class him with those enemies of the human race who do not believe in Santa Claus or fairies or all sorts of other beings and things without which we cannot well exist.

When the great original nebula began the twisting motion which established the whirl and set the gyroscope of the universe spinning in space, the gasteropod principle asserted itself. Gradually individual centres of rotation were established, each spinning on its own axis, and forming the planets. Each secondary mass revolved around the central parental mass or umbilicus, just as we find the conditions in any snail-shell. Now, if you fix your attention upon any particle of the earth, as for instance the *orthoceras*, lately discovered as all the world now knows by Professor Grabau in the front pavement of the University library, and if you follow its motion around an axis inclined to the plane of the ecliptic, you will see that it has a spiral motion in space, while the earth goes around the sun. Furthermore, if you take any well known gasteropod, such as the common or garden snail, *helix alternata*, you will see that there are the same coiled spirals manifested in the shell markings, and all turned around the tube itself. The very revolution of the particles around an axis in a planet is thus strictly in accord with the gasteropod principle.

But I hear someone remark that while the above may apply to those spiral nebulas that we see in the sky, there are other indefinite cloud-like types that have no whirl. The argument is therefore made that when applied in a comprehensive way the gasteropod principle fails. Pause a moment before rashly reaching this conclusion, and reflect that there are gasteropods *and* gasteropods. There are the shell-less slugs and snails, which are mere cloud-like matter, with but the faintest suggestion of a coil, if any at all; yet they are gasteropods, and everything which applies to them is strictly in accord with sound gasteropodian principles.

I have also a somewhat uncomfortable feeling that there may be a sincere planetesimalist among my hearers, who would eliminate the original nebula from consideration, thus destroying the foundation of my contention. But while it is conceivable that some may reject the nebular hypothesis, we do not thereby escape the whirl or rotation. Thus in the second volume of Chamberlin & Salisbury's great treatise on geology, we find the planetesimal hypothesis defined as follows: "In the planetesimal hypothesis the constituents may be molecules, or small masses of any kind moving in orbits about a common centre. They are not primarily controlled by collision and rebound (as in the other hypothesis), but by revolution about their common centre of gravity or some central body, as are the planets today." You see nothing could fit the gasteropod principle better than this. The individual planets grow by the addition of molecules, while they revolve around a common centre. That is exactly the

*Speech delivered before a geological and gastronomical society of the Columbia School of Mines. Fifth annual session. May 6, 1908.

method of growth of a coiled gasteropod. The planets, again, are not primarily controlled by collision and rebound. Neither are the gasteropods. Who ever heard of two snails colliding with such force that they rebounded? Snails, moreover, are such solemn looking creatures that they may each be considered a centre of gravity.

But suppose we pass from these early nebulous stages of the globe to the evolution of the constituents. Take South America, for example; we only need to look at its map to see that it is a dextral shell, just beginning its coil, like a *deutalium* or some such type. Africa is the same, whereas the North and Central Americas constitute a sinistral shell, exactly like *physa*, with which you are all familiar. Australia is almost exactly the outline of *fissurella*, whereas in Asia and Europe are found the counterparts of two or more closely growing *crepidulas*. All the speculations about a tetartohedral earth—such as have been set forth by W. L. Green of Honolulu or one outlined by the pentagonal network of Elie de Beaumont—fail utterly in comparison with the gasteropodian outlines and analogies.

In later time, when organic life started on the earth, it also fell an easy prey to the influences of the gasteropod principle. Whether we deal with the brachiopods or the cephalopods, or the trilobites, we find them all with a greater or less twist. The trilobites stood out longest, but at the close of the Ordovician they doubled up in repentance as they came to die, just as sinners always do, and the coiled *calymene senara* shows the futility of trying to escape the inevitable.

I cannot stop to recall the wonderful lengths to which in the Jurassic and Cretaceous this principle asserted itself in the *ammonites* and kindred forms; or in the spiral leaf-scars of the *lepidodendra* of the Carboniferous; nor in the tusks of the hairy mammoth; but the mere mention will recall them. I must come down to the present.

Thirty years ago or more the Harvard base-ball nine went to Princeton to play a game with the local team. The crimson batsmen lunged furiously at the ball, but in vain. They found that like a thing of life it avoided their strokes. In despair, finally, one of the nine slipped around behind the Princeton catcher, and discovered that the pitcher, in conformity with the gasterpod principle, had imparted a twist or curve to the ball, which only required a sufficiently long journey in the air, to return on itself whence it started. A great dispute at once arose, which characterized the journals of my own school and college days. Some physicists contended that the assumption of a curved trajectory was an impossibility. Others maintained theoretically, and demonstrated practically, that it was not only possible but easy. None, however, have recognized the true gasteropod principle of the twisting curve, until that distinguished and tireless investigator who is now addressing you, discovered it and determined to present it to you this evening.

From the world of sports we turn to the world of morals, and here we deplore the influence of the gasteropod principle. It gives that moral twist to certain characters which is so unfortunate. As in the genus *physa*, it develops a left-handed or sinistral tendency which it is almost impossible, even by very careful natural selection, to eradicate. Since the time of *Pithecanthropus erectus cocoanutticus*, that early moralist among the anthropoid apes, who first established a system of right and wrong for the evolving primates, and who drew a distinction not appreciated up to that time between his cocoanuts and those of his neighbor, *Pithecanthropus erectus rascalius*, this twist has been much in evidence. The old coiled serpent in the Garden of Eden typified it and imparted it anew to our race. It was later manifested in the struggle of Laocoon and his sons with the serpents, which symbolized the left-handed phase of the gasteropod principle of coils.

But in the world of morals we may not longer linger. We engineers and scientific men deal with problems of matter, and it is the manifestation in these that chiefly concerns us. The gasteropod principle as shown in the screw-propeller takes us speedily across the ocean; as materialized in the log-washer, rescues our iron ores from the clinging but valueless clay; as developed in the ordinary screw, binds our timbers into houses and makes habitable the inhospitable parts of the earth. During our travels we cannot escape it, because the moment when, tired and weary, we crawl into the hotel bed at night, the spiral bed-springs creak out the praises of the gasteropod principle. Speaking of beds, I am also reminded that when we go to Bedloes island and clamber to the expansive brow of the Goddess of Liberty, illuminating the world, it is up the spiral stair-case, constructed in accordance with the gasteropod principle, that we climb, and when we again descend and emerge in the form of human corkscrews, we ourselves also fall in with it. Ah! but that last phrase suggests its culminating manifestation. It is the corkscrew. From ginger-pop to champagne, how could we celebrate our Journal Club dinner without a corkscrew? Where, moreover, would be the great temperance movement if it were not for the corkscrew? Where would we ourselves be, if it had not in our infancy placed at our service the soothing syrup or other equivalent cure for the colic?

Messieurs et Mesdames, with full and grateful heart, I propose the toast, *Vive le principe gastèropodien du Monde naturel et civilisé.*

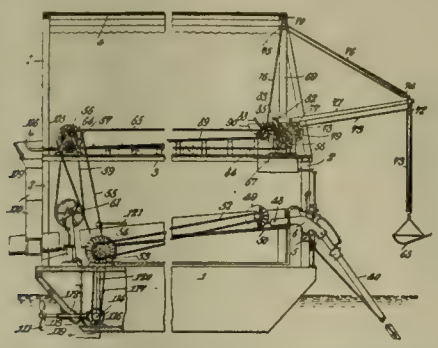
Electrolytic production of iron has been applied in making large sheets having a surface like the cutting face of a file. These are later cut up into small pieces and, secured to suitable backing, make separate files. A matrix is prepared by making impressions from a suitable die, revolving roller, or reciprocating tool in sheet of lead alloy, which in turn is mounted upon a revolving drum and suspended as an anode in a suitable electrolyte.

The deepest shafts in the Transvaal are those of the Jupiter mine, 4250 ft., and the Cinderella Deep, 4200 ft. The Jupiter shaft is being deepened steadily.

MINING AND METALLURGICAL PATENTS.

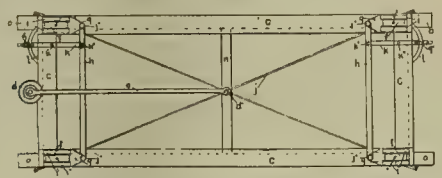
Specially reported for the MINING AND SCIENTIFIC PRESS.

DREDGE.—No. 900,263. James C. Carter, Pioneerville, Idaho.



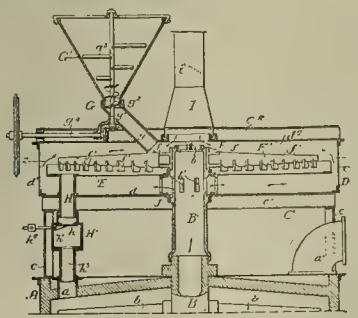
A dredge comprising a scow, dredge mechanism mounted thereon, tracks on said dredge, connected dump cars on said tracks and traveling thereon by gravity, gravity locking means at one end of each track and gravity dumping means at the other end of each track, a gravity scoop and operating means therefor carried by the scow, and a prime mover carried by the scow and connected to the said scoop-operating means.

CONCENTRATING-TABLE.—No. 900,285. Albert M. Kemp, Merton W. Loomis, and Joseph E. Fitzwater, Denver, Colorado.



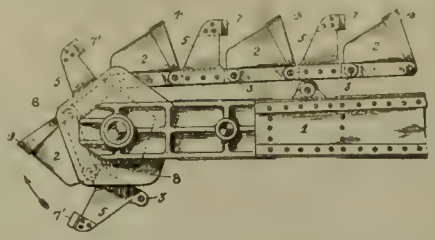
In an ore concentrator, in combination, a table-frame, a plurality of guides pivotally mounted thereon and movable in a plane parallel thereto, blocks movably mounted in said guides and carrying a deck having an ore-concentrating surface, means for connecting said guides in pairs, adjustable levers attached to said frame and each of said connecting means, means for holding said levers in any desired position, and means for reciprocating said deck.

ORE-DRIER.—No. 893,338. Daniel T. MacLeod, Merchantville, New Jersey.



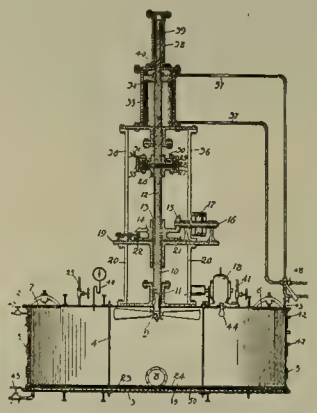
The combination of an ore roasting furnace, a drier mounted above said furnace, a vertical hollow shaft extending through the ore roasting furnace and into the drier, means for rotating said shaft, a pan in the drier situated some distance above the top of the furnace so as to form a channel under the pan, openings in the hollow shaft communicating with the said channel so that the hot air passing through the hollow shaft will enter the drier between the pan and the top of the furnace, and means for feeding material to the drier, with a discharge opening from the drier communicating with the furnace, substantially as described.

ENDLESS CHAIN BUCKET EXCAVATOR.—No. 901,008. George L. Hurst, San Francisco, California.



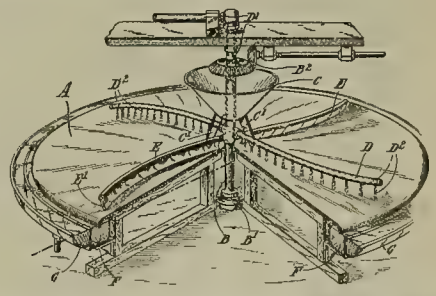
An endless chain bucket excavator and elevator, the same including a series of excavating buckets having cutting edges and a series of independent cutting devices having cutting edges arranged to extend directly in advance of and at the same depth as the cutting edge of each excavating bucket, and in the path of travel of said cutting edges of the buckets.

METALLURGICAL APPARATUS.—No. 898,415. William A. Merralls, San Francisco, California.



Metallurgical apparatus comprising a closed tank, a filter in the lower portion thereof, a liquid outlet beneath said filter, a mechanical agitator in said tank, sources of supply for pulp, solutions and compressed air, connections between said sources of supply and the upper portion of said tank, and means for closing said connections.

ORE-CONCENTRATOR.—No. 902,018. Henry L. Sulman and Evan A. Sulman, London, England.



In an apparatus for concentrating ores the combination of a fixed surface, means for feeding powdered ore over the surface, means for continuously feeding a thin stream of liquid over the surface, a movable body having a flexible squeegee edge in contact with the surface sufficiently flexible to pass over the ore while exerting sufficient pressure on the surface to remove the film of water therefrom, means for sweeping the body over the surface in a direction at right angles to the direction of flow of the water to cause the ore to be alternately exposed to the air and to the edge of the liquid.

HOME-MADE CYANIDE PLANT.

Written for the MINING AND SCIENTIFIC PRESS
By W. F. BOERICKE and B. L. EASTMAN.

The following description of a home-made cyanide plant may prove interesting in showing how low-grade tailing, formerly thrown away, is being treated at a profit by a couple of men, at small cost of labor and supplies, and a trifling initial expenditure of capital. This little plant treats the tailing from the 40-stamp mill of one of the large mines of the Grass Valley district, California. The management of the mine has not felt justified in going to the expense of erecting a large cyanide plant, as the tailing assays only from 40c. to $1 per ton. As the men who put up the plant had no contract with the mine for the tailing, they naturally sunk the least possible amount of money in the enterprise, in view of the precarious source of their supply of material.

The mill tailing is collected below the mill in sluice-boxes, and carried a half-mile down the ravine in V-shaped overhead launders. It is then allowed to flow directly, without previous sizing, into one of a series of five leaching-vats. These vats are each 18 ft. diam. and 5 ft. 6 in. deep, constructed of 2-in. redwood, and hold 40 tons of sand. One charge is obtained in 24 hours. The distributor for the sand was constructed on the ground, and has some special features, having the merit of so mixing the sand and slime that a charge with as much as 20% slime can be successfully leached. It has six arms 7 ft. long and 20 ft. wide; each of these is divided into 12 separate channels, down which the sand flows from a round central sand-box. Each channel comes to a stop before the end of the arm is reached, and a hole is bored through the bottom, through which the sand drops into the vat. These holes are so arranged that the sand is evenly distributed. Hence, there is no need of leveling the vat when it is filled. The surface is almost as level as a billiard table, and solution can be run on at once. Before entering the channels, the sand flows into a round box which is pierced at the bottom with 1-in. holes, through which the pulp spurts evenly. The launder that feeds the sand-box has four large holes, insuring even distribution without packing. Unlike most distributors, this one is lowered into the vat to be filled, and raised gradually by a windlass, a barrel of rocks serving as a counterbalance. A large proportion of the slime is floated off immediately through a system of plug-holes, of which there are three rows, 6 in. apart, the holes being 2 in. diam. As fast as the vat fills, a plug is put in and the one above it is knocked out; thus there is no loss of sand, but the slime has no chance to settle, as might be the case if the holes were only at the top of the vat.

Instead of using the familiar lawn-sprinkling device, the distributor is turned mechanically by a system of old cogwheels and bicycle-chains at about one revolution every 7 min., which is slower than most distributors. The initial power is furnished by a small stream of water falling on a home-made overshot water-wheel. The distributor travels back and forth over the leaching-vats on overhead tracks, and is pulled along by a windlass and wire ropes fastened at either end. The vats are emptied by 'hosing out' the sand through a sluice-gate at the bottom, 6 by 6 in. square. This takes about three hours.

The sand is leached in the regular manner, and receives a 96-hr. treatment. Two strengths of solution are used, the first of about 0.2%; the second is weaker; about 10 tons is introduced at one pumping, about 100 to 125 tons of solution being used altogether. No lime is added. Between each batch of solution the charge is drained for 1 to 5 hr., depending on how the sand leaches. The cyanide consumption amounts to about 0.6 lb. per ton, and the extraction is generally above 85 per cent.

The zinc-boxes are half-barrels, caulked and painted. The barren solution flows into a sump, from which it is pumped direct, after the necessary cyanide has been added, to the leaching-vats, and a small Dixon pump, which, being valveless, requires little attention. A 12-ft. wooden overshot water-wheel, constructed on the ground, gives ample power. The precipitated gold is dried on an open hearth-furnace, the zinc being partly volatilized. It is then sent to a local assayer for refining, and sold to the mint.

A natural mound in Texas is remarkable for the great number of rare earth minerals which it contains. It lies in almost the geographical centre of the State, and is locally called Baringer hill. About two dozen minerals are found in the small elevation, less than 40 ft. high and 100 by 200 ft. in plan. Among the more important ones are fergusonite, gadolinite, polycrase, yttrialite, and cyrtolite. The economic interest in these minerals is due to the incandescence of their oxides on being heated. This property makes them available for use as glowers in gas and electric lamps. Thoria, beryllia, yttria, and zirconia are the most useful minerals employed for this purpose. Until the discovery of the deposits at Baringer hill it was practically impossible to get sufficient yttria-bearing minerals to manufacture mantles for electric glow lamps; but fergusonite and gadolinite, with lesser amounts of crytolite and other minerals containing yttria, occur here in quantities large enough to meet the demand. The Nernst Lamp Co. owns this valuable deposit, but its needs require only the occasional working of the mine. After enough yttria minerals are obtained to supply its wants for several months the mine is closed. Only a few hundred pounds a year are extracted. The geologic island on which Baringer hill stands is interspersed with other mounds and dikes of similar appearance, which have been prospected, but without much success.

Superheated steam causes no chemical change in hydrocarbon cylinder oil below 750° F., according to G. W. Worrall and J. E. Southcomb. The deposits which form consist chiefly of iron oxide, the adhesion of the oxide depending upon the tarry constituent in the oil, the amount present depending on the completeness of the distillation. Further distillation of the oil occurs in the steam cylinder, leaving these tarry products behind.

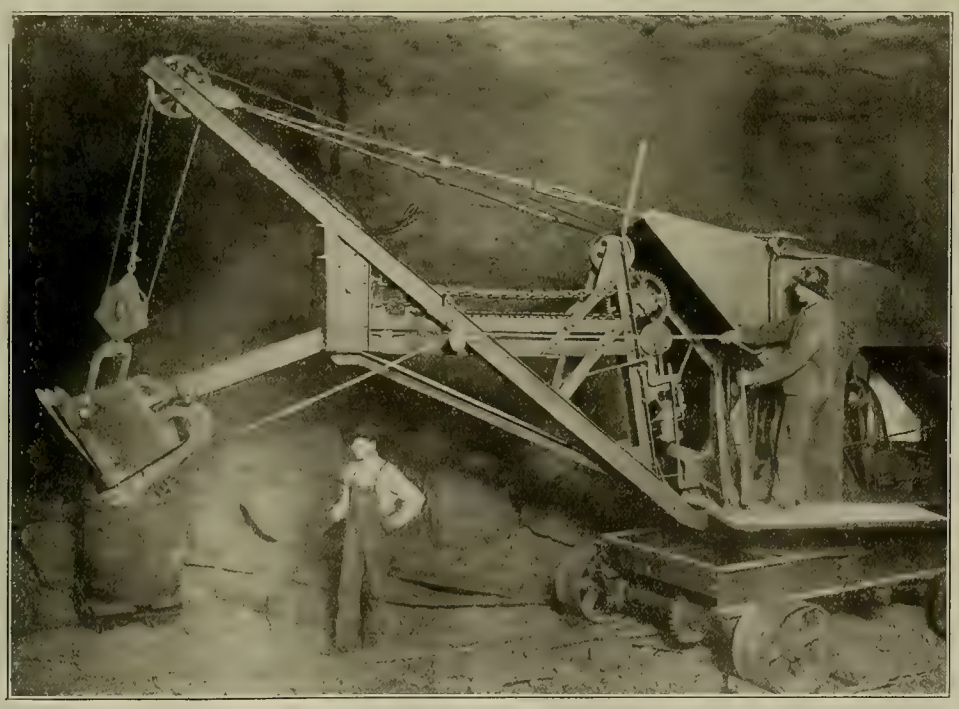
Steam-Shovel Underground.

The posibility of successfully installing power-shovels in the zinc-lead mines of southwestern Missouri has been considered by many mine owners, and many manufacturers have been consulted in regard to the proposal. To all these inquiries came the reply that it was impracticable. One man in the district persisted in his inquiry until he succeeded in interesting a shovel manufacturer in undertaking a demonstration of the practicability of operating automatic shovels underground. The man who persisted was C. W. Landrum, resident general manager for the American Zinc, Lead & Smelting Co., and the man whom he interested was Capt. R. Thew, of The Thew Automatic Shovel Co., Lorain, Ohio.

In new things perfection is seldom attained at the first effort, and the installation of a power-shovel in the Missouri zinc-lead mines was variously voted a success or a failure by different observers. But to investigators, who look beyond the mere movements of the machine, it was a success from the first. Superficial inspection may have decried it as a failure, only because it did not immediately and materially reduce the number of men required by hand-shoveling, but it has proved a financial success to the company operating it, as it requires cheaper labor and produces a larger tonnage. It is a pronounced success in never failing to supply ore to the mill. By keeping the mill in steady operation the Thew shovel becomes a profitable investment.

Steam-Shovel Underground.

The Thew automatic shovel represents the first effort in this district to install a machine for shoveling underground. The American Zinc, Lead & Smelting Co. will soon install a second shovel, and a third is contemplated when the second is in working order. The first machine was a slight modification of a standard Thew shovel, the chief change being the adoption of compressed air in place of steam. The second shovel will be modified and adjusted to local requirements. It will be lowered in height, and the radial reach will be reduced. There are other improvements under way, such as electric motor-cars for haulage to and from the shaft, instead of men or mules.



The Thew Steam-Shovel in a Joplin Mine.

A Color-Measuring Instrument.

Standards of color are not so easily established and maintained as are those for distance, weight, strength, and the like. The latter are tangible, and under similar conditions permanent. But color, once established by means of a sample, is subject to change by time and exposure. The mixing of certain proportions of specified color-ingredients does not insure absolute similarity, because of the uncontrollable variation in the elements which make up the mixture. Scientists have long sought a simple means of measuring color and of keeping records of the same, so

that it might be easily reproduced at any time. This has been accomplished in the colorimeter, invented by Frederic C. Ives.

This instrument is convenient, and practically available in the arts and industries. Its simplicity is as marvelous as its ingenuity. At one end of a rectangular box, 18 in. long, are three apertures, covered by primary-color screens of respectively red, green, and blue glass. Each of these apertures is provided with an adjustable shutter, the amount of opening of which, and hence the proportion of the given color, may be read upon a corresponding scale. The resulting color, as for instance, purple, may therefore be expressed as 'red 50,' 'green 5,' 'blue 80.' At the other end of the box is an eye piece, and at mid-length a lens in connection with a wedge-prism so placed that the light from the color-screens passes through only one half of the lens. At this point is also fixed a mixing wheel consisting of 12 convex prisms so arranged that as it revolves the prisms successively pass through the line of vision. When at rest, either red, green, or blue will appear, according to the position of the lens; but when the wheel is revolved at the proper rate of speed, the independent colors become so perfectly mixed, because of the persistence of vision, that the result is a single even color-impression. The character of this color may be changed through all hues by varying the openings of the shutters for the three primary colors. Record may be kept of each opening as read on the scale. Hence the color can be reproduced at any time by 'resetting' to the same scale readings. Through the other half of the lens can be seen the color which is to be matched, so it becomes merely a matter of adjusting the proportions of the primary colors thrown upon the first half of the lens until both halves are of the same color. Ingenious means are provided for overcoming the effect of the difference in natural lighting, as affected by weather, position of instrument, and so forth. The first of these instruments was installed some months ago at the Arthur D. Little Laboratory, Boston, where its practical usefulness has been displayed in the every-day work of a large industrial laboratory. It was through Mr. Little's recognition of the value of such an instrument, and his urgent appeal to Mr. Ives, that the device was perfected.

Commercial Paragraphs.

The National Wood Pipe Co., Los Angeles, advises that it has been awarded a contract for 40,000 ft. of its machine-banded wood-pipe, for use in the Teague, Texas, municipal water system.

The Cyanide Plant Supply Co., of San Francisco, issues a handsome and useful catalogue, describing the equipment necessary for cyanide plants. Notes on wooden tanks and instructions for erecting them are included, as well as a code for telegraphing orders to the company.

The Salt Lake Hardware Co., of Salt Lake, is proceeding rapidly with the construction of its new warehouse, the foundation and first floor being now completed. The building will be a five-story brick and concrete structure, 165 by 286 ft., and will be the finest warehouse in the entire intermountain country. The building will contain about six acres of floor space, and will afford facilities for handling eight carloads of merchandise at the same time. The company expects to issue a new 2000-page catalogue about next March.

The H. W. Johns-Manville Co. is placing on the market, under the name of 'Leak-No Metallic Compound,' a chemical composition resembling powdered iron. When mixed with water and applied like putty to defects in iron or steel articles it sets and, it is claimed, becomes really a part of the article. When hard its color is similar to that of iron. The manufacturers offer to refund the purchase price in case it fails to stop any ordinary leak in anything made of iron or steel against any pressure of oil, steam, gas, air, ammonia, or water, or to stand any heat or chemicals that iron will stand, when applied according to directions. A neat folder, describing this material, may be had for the asking.

Publications Received.

Any of the books reviewed or mentioned in these columns are for sale or procurable from the Mining and Scientific Press.

Notes on Practical Mechanical Drawing. By Victor T. Wilson and Carlos L. McMaster. Second edition, revised and enlarged. 8vo., pp. 160, Ill. East Lansing, Mich. 1908. Published by the authors. Price $1.50.

The volume is primarily a text-book, and is a valuable addition to the already large list of such practical books. The feature of the book is the admirable illustrations, many of which are examples of students' work. Machine sketching is very properly given considerable attention. A complete set of problems, arranged so that they can be used by students without further amplification, makes the book particularly useful for instruction work.

Pipes and Piping; Knocks and Kinks; Erecting Work. By Hubert E. Collins. Three separate volumes of The Power Handbooks. 16mo., Ill., Index. New York. Hill Publishing Co. 1908. Price, $1 each.

These three volumes of a series are, in the main, reprints of articles appearing in *Power*, collected and arranged in convenient form for office or shop use. They each contain valuable hints for those using and erecting machinery.

Roads and Pavements. By Frederick P. Spaulding. Third edition, revised and enlarged. 12mo, pp. 340, Ill. New York. 1908. John Wiley & Sons. Price $2.

In this edition the whole work has been practically rewritten and brought up to date. The book adds nothing to the already voluminous literature of the subject, but is nevertheless a clear presentation of the different phases of road building materials and methods. Illustrating matter is particularly conspicuous by its absence.

Mineralogy Simplified. By Henry Erni. Fourth edition. Pocket size. Soft leather cover. 414 pp., Ill. Henry Carey Baird & Co. Philadelphia. Price $2.50.

This is intended for the use of the prospector and mineral collector. It is a valuable little book, full of useful data and well indexed. The printing is good and the volume is conveniently bound in flexible morocco.

Ground Waters of San Joaquin Valley, California. Preliminary report by Walter C. Mendenhall. Water-Supply Paper No. 222, U. S. Geological Survey.

Economic Geology of the Kenova Quadrangle, Kentucky, Ohio, and West Virginia. By William Clifton Phalen. Bulletin No. 349, U. S. Geological Survey.

The Clays of Arkansas. By John C. Branner. Bulletin No. 351 of the U. S. Geological Survey.

The Transition Curve. By N. B. Kellogg. Pocket size, pp. 67, Ill. New York. McGraw Pub. Co. 1908. Price $1.75.

Catalogues Received.

Edward Christman, Massilon, Ohio, has recently issued an attractive illustrated catalogue of drilling machinery and equipment.

The Canadian Rand Co., Montreal, Quebec, has just issued its catalogue of steam and power-driven air-compressors. It contains a complete description of the theory and construction of compressors, and is a valuable addition to any library of trade publications.

L. Vogelstein & Co., New York, give the following figures of German consumption of foreign copper for the months January to September, 1908:

	Tons.
Imports of copper	122,555
Exports of copper	6,393
Consumption of copper	116,162

The consumption during the same period in 1907 was 87,480 tons. Of the above quantity, 112,829 tons were imported from the United States.

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EDITORIAL.

UNDOUBTEDLY the talk of sudden improvement in business since the election has been overdone. The daily papers have aimed to create a sensation, and some brokers have been willing to wink at anything that stimulated gambling. No sudden revival has occurred, but something more lasting, namely, a steady resumption of industry and a renewal of confidence in the future.

OUR LONDON CORRESPONDENT gives information concerning the share-holdings of the Consolidated Goldfields of South Africa. It appears that this important corporation holds large blocks of stock in Yuba Consolidated, Oroville Dredging, and United States Smelting, Refining & Mining. The holding of 12,589 shares of the smelting company's stock is interesting; the total capitalization being 150,000 shares, the block of stock held by the Consolidated Goldfields is not controlling, but it is bound to be influential.

ROCKEFELLER testified that he started in 1866 with a capital of $6000 and he now controls a business that has earned $570,000,000, paying $40,000,000 in dividends last year, while earning twice as much in that period. Equality of opportunity is a glorious thing, but it may well be asked whether in this case it has not become the opportunity to prey on others, the unrestricted chance to be essentially anti-social, the power to corrupt the fountains of justice and legislation.

LEAD is in danger of losing the protection of a high tariff. The congressional committee on the tariff will hold its last meeting at Washington on the 25th inst., and mine operators are afraid that a reduction will be recommended. At present the duty is 2⅛ cents per pound on pig lead and 1½ cents on lead in ore. As lead is selling at 4.35 cents at New York and 1½ cents at London, it is obvious that its market value would be cut in half by the removal of the protective tariff. This violent measure is unlikely, although some reduction is probable. Of course, there is a vigorous protest from those that will suffer. In the Coeur d'Alene mass meetings have been held, and in Missouri public interest is equally keen. Touch the pocket nerve and there is an instant response. That is why the tariff is let alone so long. It may be a local question, but so many local industries are involved that the issue becomes general. There are others. In Canada the Government gives a bounty on lead produced from the mines of British Columbia; this retaliates on the American tariff and bespeaks another form of artificial regulation of production. Should the tariff be lifted on this side, the bounty would probably be

denied on the other side of the international boundary. It is a broad subject and yet a delicate one. We disbelieve in special privilege to anyone, but we are sorry when such privileges are denied to our friends.

A National Newspaper.

In our last issue we referred to the baleful influence of the press of San Francisco in misleading public opinion and obstructing justice. When Thackeray started the *Pall Mall Gazette* he stated that it was to be a paper edited "by gentlemen for gentlemen". Our local newspapers, like those of many other American cities, are owned by men without character and edited by men without principle; in short, they are in the hands of men without the conception of citizenship. The power for evil exercised by Hearst and Brisbane through seven polluting papers in five American cities should suggest the tremendous influence for good that could be exerted by a national newspaper, issued simultaneously at New York, Chicago, and San Francisco. Such a paper would be non-partisan, giving the views separately of the different political parties; such a paper would give literary, dramatic, and scientific criticisms and comment that would be reliable, because written by experts; such a paper would have a few pages of local news attached to a mass of stimulating, accurate, and interesting information on the topics of the day. What university or half-dozen universities would exert so beneficent an influence? We are of the opinion that if today the University of California were closed and Mr. Benjamin Ide Wheeler, the president, were to devote himself to the editing of a morning newspaper, aided by the members of the faculty, and also if Stanford University were closed and Mr. David Starr Jordan, the president of that institution, were to edit an evening newspaper, with the help of the Stanford faculty, the community would gain immensely by the change. In this industrial civilization the average man reads a couple of books in a *year*, and at least two newspapers each *day*. Consider for a moment the mass of misinformation absorbed by the average citizen. Did you ever know a daily paper—except the four or five specified in our last issue—that could say anything about a subject on which you had accurate knowledge without that paper committing the most absurd blunders and mis-stating the facts in a perfectly puerile way? A youth—in California, for example—goes to the University, perhaps to a beautiful white building donated by the Hearst estate, for three or possibly four years; then for thirty or forty years he surrenders his mind every morning, and perhaps in the evening also, to the perverting and demoralizing influence of a Hearst paper, or to something even worse, such as De Young's *Chronicle*. Rich men have given marble palaces for the education of the youth of America. Will not some big-souled man give a few millions to endow a great newspaper? "It would not pay." We think it would, after a time. The best papers in America are profitable enterprises. And if it did not pay, what of that? Do universities pay? Not in shekels. They are not expected to be self-supporting; they are endowed by the State or by its citizens. To be independent, such a paper should not be dependent on its advertisers, while becoming an incomparable medium of publicity. Thus a national newspaper might be endowed with $10,000,000 by a successful miner or manufacturer, rich beyond his necessities and desirous of enduring fame. And better still, let some natural leader of the people organize such a newspaper enterprise, asking for the support of the mass of plain sensible citizens—those the god of whose idolatry is not prosperity alone. If our description of existing conditions is correct, and if we do not over-estimate the influence, for good and bad, of the press, this idea will find root, and from it someday will grow a benefaction farther reaching than any library and more educating than any university.

Dredging in the North.

In this issue we publish a detailed description of dredging on the Seward Peninsula; this supplements the articles previously published concerning dredging in the Yukon Territory. Most of our readers will be surprised to learn that fully 65 dredges have been built in Alaska and the Yukon, although it is fair to say that fully one half of the number represent the projects of ignorant people excited by the stories that stimulated the feverish undertakings of the boom days. These 65 dredges cost $3,000,000, and the various enterprises they represented must have absorbed, in all, at least $6,500,000. Out of the flotsam and jetsam of the boom period there survive one or two little dredges that are making money on rich ground; in addition, a number of modern first-class dredges have been built within the last two or three years; today there are 12 dredges that can be labeled as technical and commercial successes. Twelve out of 65 is a large average, as human enterprise goes, and affords encouragement to further application of this method of mining. Assuredly the modern dredge is a wonderful machine in its ability to dig into rock. In the north the soft schist, constituting the prevailing bedrock, or the weathered limestone, such as exists in the river-beds near Nome, is cut like cheese by the hardened lips of the buckets, and is raised to the surface together with the gold ensconced within the crevices of the rock. But there is one thing that a dredge cannot do, save at its peril, and that is to attack frozen ground. The gravel that is cemented by ice is no more suitable for dredging than is reinforced concrete. Occasionally a dredge may be able to remove a small patch of ground that is frozen not too completely and not too solidly, but as a rule the worn lips of the buckets, the shattered spud, the cracked gear-wheel, and the sad disarray of the whole mechanism serve as eloquent witnesses of a conflict with Nature that proved disastrous to the invention of man. Nor is it necessary to incur the risk of destruction; the frozen ground can be avoided and left to the mitigating hand of summer, to be attacked later in the season; or it may be thawed artificially by the use of 'steam-points', as described in our issue of September 12. By strip-

ping the overburden of moss and dirt, which covers the ground like a dirty blanket and affords an insulating protection to the underlying ice, it is possible to use the seasonal thaw of summer to an extent varying with each locality and each season, but sufficiently to lessen the expense of artificial thawing with steam. At this time, although methods are undergoing rapid evolution in adaptation to new conditions, it is possible to state that the cost of dredging in the North ranges in different instances from 18 to 32 cents per cubic yard, even with single dredges burdened with disproportionate charges for power. We shall discuss the question again shortly, with a view to arriving at some idea of the possible extension of this form of mining in the North, but even at this stage of the enquiry it is obvious that there is much encouragement. Of course, there have been failures, and many of them. If people play the fool, they must not expect miracles to happen to extricate them from the consequences of their folly. Dredges are built without testing the ground by drilling, or the drilling is done by the vendor of the property, or it is done in good faith, but carelessly. Then, instead of getting a machine of tried efficiency, the intending operator buys either an old second-hand contraption or undertakes a new departure and builds something designed on lines of his own devising, or on those of some similarly inexperienced person. Having got a dredge, even occasionally a first-class dredge, the mistake is made of consigning the charge of it to someone inexperienced in this kind of mining—to an electrician, a millman, an ordinary mine superintendent. The result is a smash, enforced idleness, loss of revenue. If you want to learn how to do things aright, study the story of the Three Friends dredge; if you are to be deterred by a warning, read of the blunders made by the owners of the Bourbon Creek dredge. These are typical instances, the latter especially. The worst of all waste is the waste of experience.

We have spoken of the cost of dredging in the North as ranging from 18 to 32 cents in ground not requiring steam-points. In such ground it will be possible, by employing at least two dredges on one operation and utilizing electric power generated from water, to reduce the cost so as to make it 10 to 15 cents per cubic yard. The cost of fuel is the big tax on profits. In ground requiring special treatment, by stripping and steam-points, the cost is now 20 to 25 cents, even operating on a large scale; it will be reduced to an average of 15 to 20 cents per yard. By way of comparison it is proper to quote from the report made four years ago by Mr. C. W. Purington, who described the methods then in vogue in the gravel mines of Alaska, contributing a memoir that has proved one of the most useful published by the United States Geological Survey. Mr. Purington gives 30 cents as the cost of dredging in thawed ground and 80 cents in ground requiring artificial thawing with steam-points. He was an unprejudiced observer, and it may thus be inferred how great has been the progress in this branch of mining, when the cost today can be stated by an observer equally unprejudiced to be 15 cents in unfrozen ground and 25 cents where thawing is needed. The decrease seems most marked under conditions presenting the greatest obstacle, for thawing has been improved, by better appliances and more system, until it has ceased to be the crude operation of the early days. As against a high cost there is balanced the unusual richness of the gravel in Alaska and the Yukon. Ground yielding 60 cents to 1 dollar per yard is not uncommon, and there will be ground dredged that will yield 2 dollars per yard for a month's run. The increased cost of operation is more than compensated by the unusual richness of the gravel. An engineer would rather tackle the difficult problems presented in the North with gravel at 50 cents or 1 dollar per yard, than the 10 to 15-cent material offered in localities more favored by nature. At Oroville the average yield is 15 cents and the average cost 6 cents, per yard. The ratio of profit is no better than it is in the North, and while the operating cost is near the irreducible minimum in California, it is close to a descending maximum in Alaska and the Yukon. There is offered today a splendid field for the exercise of ingenuity and skill in the exploitation of gravel deposits of unusual richness and extent.

GOSSIP reaches us from New York in regard to the ownership of *The Outlook*, a weekly periodical with which the President is to become connected. Whether Mr. Stillman and the Standard Oil control this publication, or whether they do not, the gentlemen on Wall Street have chuckled at the idea of a contract between Mr. Roosevelt and a publishing concern that might be controlled by the sinister agency he has attacked. On the whole, the evidence available indicates that no "malefactors of great wealth" own *The Outlook*, but well meaning persons of respectable character. On slips asking for a subscription to their paper, the publishers state: "The Outlook Company has the honor to announce that Theodore Roosevelt, President of the United States, will on March 5, 1909, become a member of the editorial staff of *The Outlook*, which will hereafter be the exclusive channel for his writings on Political, Social, and Industrial Topics." This is a regrettable performance, for the exploitation of the presidency in the interest of journalism is not in good taste. Why could not the participants have waited until after the President's term had ended? It may be that some of our readers consider that even an ex-President should consider the dignity of the office he has filled, and if he enters journalism or business, any reference to the presidency is unseemly. We are among those who regret the needless notoriety won by Mr. Roosevelt by his magazine writings, the quality of which is not such as to do him particular credit. His 'Alone in Cuba,' as Mr. Dooley called it, was so absurd as to have killed any but the big man he is, and his hunting stories detract from his standing as a statesman. They are not particularly good, although the man, the reformer, and the president named Theodore Roosevelt is—and, we hope, will long continue to be—a tremendous force for righteousness in the national life of America.

BY THE WAY.

H. P. Breitenbach, writing to *The Engineering Digest*, says, the movement toward appreciation of the value of English as a college study is no doubt due to a more fundamental conception of the nature of the subject. It has been too commonly assumed that the ideal of language is correct grammar; or that its main element is the study of "figures of speech and other ornaments of style." At the bottom of these notions, and possibly responsible for them, is the shallow theory that makes rhetoric a matter merely of form, with no concern for, nor relation to, the content or meaning. Corresponding to this attitude toward rhetoric is the equally shallow view of literature as designed for mere amusement or pastime. The broader and deeper conception of language and literature relates them intimately with mind and with life itself. It accords with the established doctrine that thought and language are inseparable. The teacher of rhetoric and composition, accordingly, is no longer satisfied with an essay whose merit consists in correct spelling, punctuation, and grammar. He recognizes that, while these things have their importance, it resides not in themselves, but in what they represent. The teacher goes back of the words to the ideas for which they are symbols. His task, as he conceives it, is not to teach the student to put words and sentences together like building-blocks, but rather so to train his powers of observation and analysis and so to develop and organize his powers of thought that clear and accurate expression will be the natural accompaniment. The corresponding view of literature regards it as a representation of life; its study is the endeavor to interpret the experience of others in terms of one's own experience.

Considered in this light, the study of his language and its literature, it is readily seen, will form an increasingly large part of the education of every successful professional man. With the maturing of his powers he will draw more and more upon the stores of knowledge which the race has accumulated in the form of literature; and correspondingly, too, he will extend his own range of influence through the expression of his ideas. For the engineer, the two main media of expression are drawing and the spoken or written word. As he advances in his profession, the latter becomes more important.

The influence of his speech on the success of the engineer is too often lost sight of. By the instructions he gives to his subordinates, by his conversations and discussions with his fellow engineers, and by his attitude toward those that seek his advice, especially when he has to address himself to an audience of some size, such as a board of directors, a learned society, or a meeting of the general public—by such means and in such cases his professional reputation and success are increased or diminished. When he appears in court as witness, says one of the chief authorities of the country on the legal aspect of engineering, he is apt to be unsuccessful "because of a lack of prompt comprehension of the English language." The ability of an engineer is often judged by the business letters he writes. Certainly they in great measure determine his success. The well-written letter of application secures for him the desired position. The courteous answer to an enquiry leads to desirable business relations.

When the letter is addressed to a technical journal or when an article is written for publication, even more important results may ensue. Immeasurably wider circles of influence are thus opened to the individual. To an article or communication written for a technical journal, more than one engineer can ascribe a rapid rise in his profession. The indifferent or careless engineer reasons that the editorial revision of his letter or article will straighten out its tangled logic or its confused statements. It is true that the editor's blue pencil does so much and more, in innumerable cases. Any editor of a technical journal will bear feeling witness to that. Indeed, regarding the literary deficiencies of the contributions of many engineers, he will wax positively pathetic. Moreover, the periodical itself generally, despite his valiant editorial labor, will afford eloquent testimony. Yet the standard of the engineering journals is rising, and for the editorial columns of some of them one need feel no shame. Moreover, the increasing number of new periodicals and the enlarging circulation of the old ones are evidence that the engineering profession is coming to a fuller appreciation of the enormous importance to them of these organs of communication. Evidently the rising standard of the technical press is making increased demands not only, as mentioned above, on the contributors, but also on the editors as well. So much, in fact, is definitely set forth in a recent editorial in *Engineering News*. Therein the writer asserts that the greatest need in engineering literature today is for better quality. In his illuminating discussion he appeals "as much for high standards of editorial work as for greater care on the part of contributors." Without doubt, the engineer of the future, with his increased capacity for expression in English, and possibly with special university training in journalism, is going to respond to the already voiced demand for better technical editors.

To say that engineers are becoming conscious that they constitute a profession and that they are becoming aware of the implications thereof is, in a sense, to sum up the whole matter. As a professional man, the engineer must needs share in the culture of the world; and of this larger life of humanity the English language and literature embodies an important part. His enlarged relations with mankind are reflected in increased requirements for expression. As an applied scientist whose objective point is "the use and convenience of man," he must make his knowledge humanly serviceable, not only by embodying it in structures and machines, but by extending the range of it as knowledge. In the inspiring words of the great historian Mommsen, "The art of measuring brings the world into subjection to man; the art of writing prevents his knowledge from perishing along with himself; together they make him—what nature has not made him—all-powerful and eternal."

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

JAMES W. NEILL is at Butte.

J. H. CURLE is in West Africa.

HARRY J. ARKELL is in Nicaragua.

WILLIAM A. FARISH is in Sinaloa.

FRANK PROBERT is at Rawhide, Nevada.

W. B. MCKINLAY is at Durango, Mexico.

WILLARD S. MORSE is here from Salt Lake.

COURTENAY DE KALB has returned from Utah

F. J. BOOTH is now at Culiacan, in Sinaloa, Mexico.

F. W. OLDFIELD, of Los Angeles, has gone to Mexico.

BENJ. F. TIBBY has an office at Salt Lake City, Utah.

W. B. WINSTON has returned from a trip to Chihuahua, Mexico.

JULES R. BREAUCHAUD is at Santa Rosa, in Guanajuato, Mexico.

C. B. HOADLEY is engaged in cyanidation at Searchlight, Nevada.

HERBERT W. ROSS is with the Cerro de Pasco Mining Co., in Peru.

C. V. CORLESS is manager for the Mond Nickel Co., in Ontario, Canada.

EUGENE BRADEN is at Salt Lake, and probably will proceed to New York.

S. D. BRIDGE, of Bridge & Tuttle, Monterrey, was recently in Durango, Mexico.

GODFREY DOVETON is now associated with the firm of Spurr & Cox, at Mexico City.

JOSEPH E. WHITE is superintendent of the Quartette mine, at Searchlight, Nevada.

W. J. BARNETT, who was recently in Siberia, is on his way from London to Nevada.

R. S. RAINSFORD is manager of the Argonaut mine, in Amador county, California.

E. SEABORN MARKS is in San Francisco, on his way from London to the Malay Peninsula.

S. SPENCE has been appointed business manager for Bewick, Moreing & Co., in Burmah.

RICHARD A. PARKER has just returned from an inspection of iron deposits in southern Utah.

JONATHAN P. SMITH has returned from the Copper River country, Alaska, and he is now at Pasadena.

ALEX F. REID has resigned as metallurgist to the Montana Mining Co. and is now at Los Angeles.

F. G. T. NICHOLAS has resumed his position as business manager for Bewick, Moreing & Co., at Kalgoorlie.

COREY C. BRAYTON is superintendent of the Asientos plant of the American Smelting & Refining Co. in Mexico.

C. W. GEDDES has completed an examination of the Sudbury nickel mines, in Canada, and is now at New York.

H. H. WEBB suffered from a severe attack of ptomaine poisoning while at New York. He is expected in California.

S. F. SHAW, of Pasadena, has returned from Bodie, Cal., and is now examining copper properties in Sonora, Mexico.

W. J. AUW and F. ORTIZ CLARCKE have opened an office at Velardeña, Durango, Mexico, to engage in assaying and engineering.

ARTHUR L. PEARSE, of London, and PHILIP C. STOESS, of Seattle, have been in San Francisco, in connection with the business of the Alaska-Perseverance mine.

ARTHUR THOMAS, who has been manager of the Famatina mine, Argentina, for the last three years, has had to resign his position, owing to his health being adversely affected by the high altitude.

E. N. SKINNER, who has been working for some years for the Guggenheims as assistant to A. Chester Beatty, is now connected with the mining department of Trippe & Co., 25 Broad street, New York.

ARTHUR W. STEVENS, who has been in active charge of the Boise King placers in Idaho for the past two years, resigned in June so as to have time in which to make examinations in the northern part of Idaho. He has recently been appointed engineer for the Boise King Placers Company.

On Saturday, November 21, the first meeting of the Pacific Coast section of the Mining and Metallurgical Society of America was held at the Hotel St. Francis, San Francisco. Those present were: George W. Starr, Ernest A. Hersam, Mark B. Kerr, Whitman Symmes, C. C. Derby, F. W. Bradley, J. Nelson Nevins, H. W. Turner, S. B. Christy, E. P. Kennedy, Charles Butters, T. A. Rickard. The last mentioned was unanimously elected permanent Secretary of the Section. The next meeting will be held on December 19, at the same place. A dinner at 6:30 p. m. will precede the discussion. Members of the Society, as well as those properly endorsed for election, are invited to notify the local Secretary as soon as they are able to decide whether they will be present at the meeting. The subject for discussion is that chosen by the Council, namely: What action may be taken by the Society to secure the publication of reports by mining companies which shall contain the information necessary for the full protection of the interests of mine investors? The next question to come before the Pacific Coast Section is the relation of the engineer to finance, lately ventilated in another place.

Latest Market Reports.

LOCAL METAL PRICES—November 25.

Antimony	12@16c	Quicksilver (flask)	$45@46
Casting Copper (scrap)	8¼@13½c	Spelter	6¼@7c
Pig Lead	4.55@5.50c	Tin	32@33½c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Nov. 20	14.12	4.31	5.10	49⅞
" 21	14.13	4.31	5.10	49⅞
" 22	Sunday.	No market.		
" 23	14.06	4.31	5.10	49⅝
" 24	14.06	4.30	5.11	49¼
" 25	14.06	4.30	5.11	49¼
" 26	Holiday.	No market.		

SOUTHERN NEVADA STOCKS.

San Francisco, November 25.

Atlanta	$ 21	Laguna	$ 1.25
Belmont	1.02	MacNamara	47
Booth	29	Manhattan Con	6
Columbia Mtn	17	Midway	26
Combination Fraction	1.42	Montana Tonopah	1.00
Daisy	98	Nevada Hills	1.50
Fairview Eagle	25	Rawhide Queen	75
Florence	4.65	Sandstorm	23
Gold Bar (Bullfrog)	2	Silver Pick	13
Goldfield Con	7.15	St. Ives	25
Gold Kewenas	27	Tonopah Extension	53
Great Bend	33	Tonopah of Nevada	6.70
Jim Butler	18	Tramp Con	16
Jumbo Extension	29	West End	41

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. November 25.		Closing prices. November 25.
Adventure	8⅞	Mohawk	70¼
Ahmeek	115	Nevada Con	19½
Allouez	39½	North Butte	87
Amalgamated	84⅜	Old Dominion	58¼
Arcadian	4¾	Osceola	124
Atlantic	18¼	Parrot	26½
Boston Con	16¾	Quincy	96
Butte Coalition	27⅞	Rhode Island	6⅛
Calumet & Arizona	120½	Santa Fe	2¾
Calumet & Hecla	685	Shannon	16
Centennial	35¼	Superior & Pittsburg	18½
Copper Range	82	Tamarack	83½
Daly-West	10¼	Trinity	17½
Franklin	18½	United Copper Con	14½
Granby	106	Utah Copper	
Greene-Cananea, ctf	11⅛	Victoria	4¼
Isle Royale	25	Winona	6¼
Mass	6¾	Wolverine	150

General Mining News.

ALASKA.

(Special Correspondence).—Hot Springs, in the Rampart region of Alaska, aside from being the garden spot of the North, is backed by a most promising mining district, namely, Sullivan Creek, 15 miles distant. Sullivan Creek is the most accessible of the new camps, as the Government mail-trail crosses the Discovery claim. This camp is less than a year and a half old, and at the time of writing there are 300 miners on the ground; 20 laymen are on good pay and a big output is looked for this winter. There are both summer and winter diggings here. The Dakota group, of eight claims, is the best to date. Pans run anywhere from 50c. to $7.50. It is situated on the left limit of Sullivan creek, and has an average depth of 60 ft. On Discovery claim, which is on the right limit, and from which $20,000 was taken in two months, the gravel is but 30 ft. deep and pay is found at 20 ft. The camp, which gets its name from M. J. Sullivan, one of the first locators, received no attention until three prospectors by the name of Kemper, Snyder, and Harter made their find on Discovery. Association claims, the curse to the diligent and well-meaning prospector, have been the means of keeping back the camp, and while our mining laws permit and make it possible for a few men to stake a country from Dan to Beersheba, there will ever be trouble. The cry from Sullivan, and in fact, every mining camp, where the prospector may stand a reasonable show is: "Abolish the association claim!" However, things are righting themselves, and much litigation has been avoided by the coming at the nick of time of mining operators with capital, who have purchased the controlling interests in two associations that have made good. On the Dakota group, the following lay-men will operate this winter: Baker, Winde, Jepson, and Ferondo, with 30-hp. boiler; Neville, Erhns, and Lowe, 12-hp. boiler; while Fitzgerald, Jones, and Davenport, Lyn Smith, and Sam Oakley are olso expecting large plants to operate their lays, and E. Richards, of Fairbanks, a well-known mining operator, will install a 30-hp. plant on a 250-ft. lay. The other claims on the left limit which have shown pay and which are lined up with the Dakota are the Jackson bench, Midnight Sun, American bench. The last of these will be operated by Leonard Dodge with 16-hp. boiler. The Abe Lincoln will be worked on a large scale by Gill Edgar. So much for Sullivan creek. As to its numerous tributaries, I shall mention a few that have shown pay: on Quartz creek, a tributary on the left limit, Johnson & McIntyre have had a crew working all summer in good dirt, and have found the pay six feet from the surface and good prospects from the moss roots down. Tufty gulch, the banner tributary of Sullivan and the creek that has produced the most to date, is on the right limit opposite Discovery. Joe Egler, the well-known mining operator of Esther creek and Fairbanks, has purchased the controlling interests on Tufty gulch, and a 60-hp. plant is expected for this creek. Woodchopper creek, which empties into Sullivan five miles below Discovery, also shows ground that will pay to work. Booker, Krough, and others, with a large oufit, will work there this winter. The miners in general are well pleased with the road work that has been done this summer, and much praise is due to the Rand Commission for their timely service. The N. C. Co. has now taken over the trading post of F. G. Manley, and the Manley hotel has been crowded all fall. Hot Springs will soon have another newspaper, Word and Arbuckle being the proprietors.

Hot Springs, November 12.

CALIFORNIA.

PLACER COUNTY.

Nearly a mile of track has been laid in the old Paragon adit. Gravel is being taken out and the mill is run one shift per day. The removal of a blockade in the lower adit and the consequent rush of water and dirt into Volcano canyon, buried the flumes and boxes of West & Co. and stopped work for a time.——Ed. Kavanaugh has a small force of men at work at the Black Canyon quartz mine. ——W. S. Fletcher has a small force working the back channel of the Dardanells. The breast in the gravel is 8 ft. high and is gradually increasing. The normal depth is 14 ft. The gravel is rich, running from $3 to $20 per pan.

SHASTA COUNTY.

The Fairview mine, near Minersville, which is operating 15 stamps, has a force of from 30 to 40 men employed. The clean-up is averaging about $10,000 per month.——The Mammoth Copper Mining Co. is putting in a new powder-thawing plant near the present magazine, to have a capacity of about 24 hours' powder supply. An electric heater will be used.——The Dorleska mine, near the head of Coffee creek, is under lease to M. H. MacIlwaine, C. E. White, John and Charles Kingsbury. Good ore has been taken out and a mill run will be made this fall. Mining operations will be continued all winter for an early spring run at the mill. As the lease will expire early next year, work will be pushed.

SIERRA COUNTY.

Assessment work is in progress at the Pacific, at Howland Flat, and it is probable that eight or nine men will be employed all winter. William Casserly is foreman.—— A force of men are working at William Shaughnessy's sawmill at China Flat getting out the timbers and lumber necessary for the building of the Gray Eagle tramway. The cable and accessories have been delivered on the ground, and if the weather continues good for a few weeks the tramway will be in running order.——M. R. Rose, of Goldfield, has taken a bond on the Eureka quartz claim, near Forest, and will start development at once. Perry Bixby is the owner.——Charles Delamare Maze, of San Francisco, has purchased the sulphurets of the Empire mine in Gold valley and will work them himself this winter. He will use the cyanide process and expects to employ two or three men.——J. C. Chandler has returned to Forest and will at once start work again on the shaft he is sinking on the site of the old Forest House. He intends to go down to a depth of 500 ft. and has all his timbers out and ready to haul to the ground. A gasoline engine is in Nevada City and will be hauled to the ground immediately.

SISKIYOU COUNTY.

The Cook & Green group of copper claims, near the Blue Ledge camp, has been sold to W. A. Phillips, of London, England, who is said to be organizing a company to work the property.

TUOLUMNE COUNTY.

Lack of water to supply power has forced a suspension of operations at the Arbona at Tuttletown.——A gasoline engine and hoist have been put in at the Sweeney.——Jesse Burns and William Hampton have bought a half interest in the Lodi, and will proceed to extend the adit to tap the vein in the shaft at the depth of 60 feet.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Work was again started this week in an attempt to make connection with the Seven-Thirty shaft from the raise made from the West Phillips drift, of the Burleigh adit. Owing to the great danger to life and property, Owen Rice, who is manager, has secured a diamond-drill and the ground is to be prospected in a thorough manner. Surveys show that the raise is 30 ft. above the bottom of the shaft, but as all the old maps have either been lost or destroyed, it is impossible to tell the exact location. With this piece of mining completed, one of the early-day heavy producers of silver-lead ore will have been rejuvenated.——Work is to be carried on throughout the winter months on the holdings of the Ruby Argentine M. & M. Co. Supplies have been taken in and a force of 10 men will continue work in driving the Calla adit. A vein was intersected last week, but only small streaks of ore are showing. No driving is to be done until the head-

ing of the bore cuts the Calla vein, which is supposed to be between 50 and 70 ft. distant. R. C. Vidler, of Golden, is manager.——H. M. Vincent, owner of the Reveille group of claims, is employing a small force of men in driving his adit. The bore is in 600 ft., three veins having been intersected. No driving has yet been started.——The Vesper group of claims is making a fine showing. Since the Gold Coin vein was cut, driving has been started and a small streak of ore is showing that is worth $275 per ton in gold and silver. G. Crump is manager.——An 8-in. streak of silver-lead ore has been uncovered 1600 ft. from the portal of the lower adit of the Wide West mine. Driving has been started. L. Baccheiri is lessee.——M. Jacoby has put men to work on the Old Hickory group of claims, on Columbian Mtn. The adit is to be advanced for the intersecting of the series of veins controlled.——J. G. Hite is at work in the development of the White vein. The adit has been driven 450 ft. The crevice is five feet wide and the vein runs as straight as a die. A big body of quartz is showing, while occasional feeders of exceptional high-grade ore put in their appearance.——The Conqueror G. M. Co. is employing a big force of men in the development of its holdings on Covode Mtn. Driving is in progress upon the Conqueror vein and a body of ore is exposed that is from three to four feet wide. The mill is being remodeled and will hereafter use electric power. It is expected to start the machinery within 30 days.——The Knickerbocker M. & M. Co., recently organized, has started a force of men at work in the development of its holdings. A plant of machinery has been ordered, which it is expected will arrive within the next 10 days. Operations for the present will be confined to surface, but later on arrangements will be made whereby work will be carried on through the Empress adit. The construction of a modern concentrating plant is being considered. William E. Hogel, of Idaho Springs, is manager. ——The Equity Con. M. Co. has been incorporated with a capital stock of $1,100,000, to develop a group of claims on the line of the Newhouse adit. R. J. Bardwell, of Denver, is resident agent.——During the last month 15 leases have been granted by W. S. Leebrick, of Idaho Springs, manager of the Little Mattie mine, on Chicago Mtn. Work is well under way and heavy shipments are promised for the future. ——The Crazy Girl is to be started by John Cousins. The adit will be driven ahead to cut under the shaft workings, from which high-grade ore was mined a few years ago. The property is situated up South gulch in the Freeland district.——From 1200 to 1300 tons of 3 to 5-oz. gold ore are being shipped each month from the Specie Payment mine, Seaton Mtn. Operations are conducted through the Two Brothers adit.——The Salisbury mill is running night and day upon ores from the Stanley mine. Only material of a low grade is being treated, but the finished product is worth from $35 to $40 per ton.——The Burns-Moore adit has now been advanced for 3342 ft. A few days ago the Parnell vein was intersected, and while ore in paying quantities was not found, the entire vein matter is heavily mineralized. In a vertical line the Parnell apex is 623 ft. above the adit level, and it became necessary to drive 1210 ft. beyond the apex before the vein was reached. This gives about 1350 ft. of vein on the dip. W. W. Cannady, of Idaho Springs, is manager.——An 8-in. streak of $100 ore has been uncovered on the Amazan, Seaton Mtn. This property is being operated by a pool of local men, headed by James Humphrey, of Idaho Springs.

Georgetown, November 21.

EAGLE COUNTY.

The Colorado Fuel & Iron Co. is operating the Black Iron property near Red Cliff, producing nearly 4000 tons of manganese ore per month, which goes to their steel plant at Pueblo. This is the biggest production the Black Iron has experienced for several years, and has aided in booming the Eagle county district.——Arrangements are being made for the erection of a large mill on the Iron Mask property. Ground is now being broken and material is on the way. Al Pascho, formerly of Leadville, is in charge of the work. The plant will treat the zinc ore produced at the Iron Mask mine, and will also make a bid for the treatment of ore produced at other small properties in the same neighborhood.

TELLER COUNTY.

A strike of unusual richness is reported from the Dante Gold Mining Co.'s No. 2 shaft, operated under lease by the British-American Mining Co. The find has been made in the stope between the 400 and 500-ft. levels, where machine-drills are in operation in the development of a six-foot vein. ——McConnell and associates, residents of Cameron, have secured a prospecting permit with an option to lease on Block 8 of the Bonanza Contact Mining Co.'s estate on the northeastern slope of Ironclad hill, and have commenced work at surface. This leasing block is situated in the brecciated area near the main shaft.——Work has been resumed by Fred Baker and associates, holding the lease on the Mountain Goat and other holdings of the Comanche Plume Mining Co. on the western slope of Battle mountain.

GILPIN COUNTY.

Knutson & Son, of Philadelphia, have taken a lease and bond on the Leontine claim on Quartz hill, near the Ivanhoe property, and have been cleaning out the shaft and doing some re-timbering work preliminary to carrying out active developments. The shaft is reported to be between 80 and 90 ft. deep and the lessees will probably sink so as to open up some new ground.——Harry Armfield & Co., of Nevedaville, have taken a lease on the Forks mine on Quartz hill and have commenced preliminary work.——It is reported that as soon as the Searle mine in Willis gulch is connected with the main line of the Gilpin tramway a compressor and heavier hoist will be installed. The property is owned by the Druid Mining Co., for which Joel F. Vaile, of Denver, is superintendent and C. W. Anderson is manager.——Articles of incorporation of the Rio Claro M. & M. Co. have been filed with the county clerk and recorder showing capital stock of $380,000, and with Henry A. Hicks, Richard H. Brown, and Edward W. Davis as incorporators. The company will operate in Gilpin county and will have its main office in Central City.——W. H. McFarland, of Toledo, O., is at Central City, to look after interests in the Parole and Morning Star claims on Bobtail hill. He will at once make arrangements for the installation of a first-class plant of machinery and for the erection of a shaft building, expecting to commence active developments before the close of the year.

LAKE COUNTY.

F. E. Hayden has leased and bonded the Dolomite, Laurel, and Echo claims to S. P. Fenton, of Buena Vista, work to begin not later than December 1. These claims are in Adelaide Park, and their surroundings, as well as actual discoveries make the ground extremely promising.——Timothy Kyle has a small force of men at work on the Boulder property in Big Evans gulch. It is likely that this shaft will be worked during the winter. The entrance of the Yak tunnel into that section has drained the property, which will allow its thorough exploration. The Boulder has not produced for several years, but has been handicapped by water. With this difficulty eliminated, it is believed the mine can be placed on a paying basis.——Simon Wheatley has a force of men at work driving the Rosse adit on a contract with the Independent District Consolidated Mines Co., which was recently incorporated to work the Berdella and St. Kevin properties west of the river. In addition to running 200 ft. on this work, he will also clean out the old adit which was driven in the early days. As soon as the Wheatley contract is completed, another of 200 ft. will be let. Under this system the entire distance of 1200 ft. to the old St. Kevin and Grand View veins will be driven. In the meantime work is going on at the Berdella under the direct management of the Company. The bore is now in 325 ft. Arrangements are now being made to install a steam-power plant at the Berdella. Eventually electricity will be used.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The principal feature of the mining industry of the Coeur d'Alene during the past week

has been the general stand taken by the district in connection with the tariff on lead and zinc ores. Toward the beginning of the week word was received to the effect that the tariff on lead and zinc ores would be brought before the Congressional committee, dealing with the tariff revision, about November 25. Accompanying this report came the rumor to the effect that an organized attempt would be made on the part of certain smelters and manufacturers to have this tariff reduced. Without an instant's loss of time mass-meetings of the people of the district were called in every town of the Coeur d'Alene. At each of these meetings ways and means of combatting any reduction of the tariff were discussed and two delegates were elected to a second meeting of the business men and mine operators held in Wallace Monday. In the meantime petitions against the reduction were drawn up and circulated, receiving the signatures of practically every man in the district, communication was entered into at once with Senators W. B. Heyburn and William E. Borah, of this State. At the meeting of the delegates and operators, in Wallace, the following committee was selected to go to Washington to appear before the Congressional committee when the matter of ores should come up for discussion: W. Clayton Miller, William J. Brand, Herman J. Rossi, Al Page, and D. E. Keys. All of these men left Wallace Wednesday, and the expenses of the delegation to Washington will be met by the operators of the district.——H. F. Samuels, the owner of the Success mine and the man who first solved the problem of extracting zinc from the ores of this district, has returned from a trip to British Columbia, where he inspected the new electric zinc smelter recently erected under the auspices of the British Government to operate the patents of Snyder and others. Mr. Samuels expresses himself as delighted with the trial, and has made the announcement that if a continuous run of the plant proves equal to the trials which he witnessed, he will erect a zinc smelter in Wallace for the treatment of the ores from the Success and other zinc properties of the district.——A contract for 100 ft. of work has just been let on the property of the Snow Cliff Mining Co., in the Lookout district. This property is practically an undeveloped prospect, but several rich strikes in the adjacent mines have caused the owners to accept and offer on a pure stock basis.——A new company, known as the Idaho-Knickerbocker Mines Co., has been formed by A. D. Gritman, of Spokane, for the purpose of taking over the property of the Charles Dickens Co., over which there has been so much ill feeling and litigation recently. The new company has a capitalization of $1,500,000 in shares of a par value of $1, and Mr. Gritman has subscribed to the whole, with the exception of 50 shares. Holders of stock in the old Charles Dickens company are offered an amount of stock in the new company equal to their old holdings in consideration of payment at the rate of 7 cents per share and in further consideration of their surrendering their stock in the old company.——At a well-attended meeting of the stockholders of the Butte & Coeur d'Alene Mining Co., held in Mullan at the beginning of the week, the contract for treatment of ore from this mine at the Panhandle smelter was signed and the directors decided to install the contemplated machinery without delay. Fleetwood Ward and J. J. Blandenstein, of Spokane, are two of the principal owners.——Practically all the suits against the Rex Mining Co. have been settled by B. M. Francis, promoter of the old company, and in the course of another week or so bids will be asked for 300 ft. of shaft work which will be let in lots of 100 ft. Mr. Francis makes the announcement that he has succeeded in interesting the Marshal Field estate, of Chicago, and one or two capitalists of that city to the extent of about $100,000. The property is fully equipped with a mill, but shipments will not be resumed until the shaft work referred to has been completed.——Charges of fraud are being made in connection with the Amador mine which created such a sensation a short time ago in Chicago. S. W. Eddy, a mining man of Worcester, Massachusetts, who has just made an examination of the property, declares that a fine orebody showing on the 700-ft. level was concealed by plastering dust over the entire face of the drift. This ore he claims to have uncovered by the use of a pick. Samples of ore taken from different parts of the mine and dump showed chalcopyrite and peacock copper assaying all the way from 3 to 35%. Mr. Eddy states that the vein runs all the way from 5 to 35 ft. wide and several hundred feet long. An assessment of two cents per share was recently made on the capital stock of the Company and the payments are said to be coming in satisfactorily. It is expected that a resumption of work will be made in the near future.

Wallace, November 21.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—McKinney & Co. have finished the new shaft near the mill and have found good zinc-blende at 124 ft. The ore is high-grade and is found in large quantities. A tramway has been completed to the mill.——Operations are to be resumed at the Hartford mine, in the Empire district. The 250-ton mill is practically new, as it was completed last spring and operated only a short time before the company closed down. A pump has been installed at the shallow drifts to drain the ground and larger pumps will be put in for the lower levels. The mill shaft is 172 ft. deep and a drift has been started to another shaft 300 ft. distant. When it is completed ore will be hoisted from both shafts.——The 200-ton mining plant of A. G. James, in the Cave Springs district, has been overhauled and will be started at once. The ore on this tract is found from 110 to 160 ft. and the land is well developed. A peculiar feature is that the lead is found at the lowest level and is of unusual richness, while the zinc-blende is above the galena deposit. The opposite conditions usually prevail in the Joplin district.——The Black Jack property, in Baxter Springs, was the scene of a good strike last week. No. 2 shaft was being sunk when at 85 ft. the cap rock was penetrated and the ores, both galena and zinc-blende, were found in open ground. The company has started shaft No. 3 at a point where the drill showed a rich ore deposit at 114 ft. A contract will be let for a large mill to be erected this winter.——A number of properties are to be started in the Baxter Springs camp soon. The Hannibal & St. Joe mine has been drained preparatory for resumption. The Alabama mill has just been started. A large amount of development has been done and the company is planning to build a mill. The Mason mine is to be started under the new management. A centrifugal pump has been installed. The 3 F mine is being put in condition to operate again. This is the only daylight mine in the camp and tons of the ore can be seen from the surface. One of the best galena strikes in the camp was made by Creech & Co. in the Joanna mine. Large chunks of free galena were found both in the north end and in the southeast part of the lease. A car of chunk lead will be shipped from this mine.——Work on the Lucile mill is progressing rapidly and a large amount of development work has been done to insure steady production when the mill is finished.——One of the most important strikes in this portion of the camp was made at Keelville on the Ludlow farm, west of Baxter Springs. The ore was struck in a drill-hole at 160 ft. and a 10-ft. face was opened up. More drilling will be done. The strike is important and is causing excitement, as it is in virgin territory, the first in that region. Adjoining leases have been taken rapidly and will be prospected.

Galena, November 20.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The past two weeks has noted some exceptional strikes all over the county. On the Whitworth land, north of Webb City, the richest sheet-ore strike of that portion of the camp has been made. In 11 drill-holes the ore was struck at 150 ft., showing a 14-ft. face of zinc-blende and galena. Two holes were sunk below this run and 18 ft. struck a second run fully as rich, but with a 10-ft. face of the ore. A shaft has been started and development work will be hastened.——A rich face of zinc-

blende has been opened up at 35 ft. on the Cox land on Turkey creek. The ore mills 20% on a custom plant.——The richest strike ever reported from Reeds station was recently made by the Grace-Clark Mining Co. The Company has been operating about three weeks and in that time has taken out 40,000 lb. of silicate and 5000 lb. of zinc-blende. Some chunks of the silicate weighing 500 lb. have been hoisted from a depth of 60 ft. Ore is found in this vicinity at both shallow and deep levels. Many small silicate diggings are active, while the Ravenwood Co. is operating sheet ground from 200 ft. to 250 ft., loading a car of zinc ore per week.——Two rich strikes have been reported from Carl Junction within the week. Smith & Brummit, operating a lease of the Smith-Moler land, have struck ore at 67 ft. which runs 30%. The ore will be cleaned on hand-jigs, as it is rich and free from iron. New machinery is being installed. The second strike was made by the Jubilee Mining Co. at 75 ft., with the ore extending to 95 ft. The ore was first cut at a shallower level, but the richest was found at 75 ft. Development has started and hand-jigs are being installed to treat the ore.——Among the new mills of the district one of the largest is the Marvel mill, on the Cosgrove land at Duenweg. The plant is only just completed and has made one turn-in. The Cosgrove land is among the richest of the sheet-ore properties in the district, the ore running from 10 to 25% zinc-blende and 2 to 3% lead. The mill is owned by Brubaker Bros., who are operating the lease.——A small mining plant is being installed at the Thirty Year Mining Co.'s land in West Hollow. A rich body of galena and zinc-blende has been recently developed there.——The Navy Bean mill at Wentworth has been dismantled and is being moved to the Houk lease, on Turkey creek. The mill will be a plant of 150 tons. The ore at the old Navy Bean mine, at Wentworth, will be handled by a mill in the vicinity. The old Houk property was operated years ago, but was abandoned on account of water. The new centrifugal pumps have drained the drifts without difficulty and the old workings are being rapidly reopened.——A number of properties are resuming operations after shut-downs for various reasons. The old Haggerty mill, southwest of Joplin, has been overhauled and new machinery added. This was the first plant to be built in that portion of the camp and has done much for the original development of the rich southwestern field in the Joplin district.——The White Dog mine in the north Webb City field has been started again and is one of the best producers of sheet ore in the district. The ore is taken from the 165-ft. level. The new mill has a capacity of 250 tons.——One-half of the Monark-Nemo mill north of Webb City has been started. The double plant has a capacity of 800 tons. It was built to handle the ore from two leases and is on the dividing line. The Guinn & Aylor lands are both held by the company and their production is handled on the same mill. More than 400 ft. of drifts have been opened up.——Sucker Flats, once a good ore tract south of Webb City, is being developed again by the Southtown Mining Co. A new mill has recently been built which made its first turn-in last week.——Lanyon & Price will resume operations in the Alba field after a shut-down of nearly a year. The ore is found from 140 to 150 ft. and a drift 20 ft. high and 40 ft. wide is being carried. The mill is kept busy during operations, as the mine is a splendid producer. The mine was easily drained, as are all the mines in the Alba camp.——The Joplin camp is being extended westward by the development on the Big Three lease on the Cunningham land. A shaft has recently been sunk to 115 ft., where a 15-ft. face of ore has been struck. The ore is peculiar in character, being very greatly disseminated, every particle of rock picked up bearing a small piece of ore. This should make it a rich milling proposition. Forty feet of driving has been done.——The McMillan Mining Co., at Four Corners, has been re-organized and new development of the tract will be hastened. A shaft is down to 60 ft. and driving has been begun at 50 ft. Ore is found from 28 to 50 ft. and a deeper and richer run from 60 to 80 ft. Hand-jigs are used and the equipment is to be doubled.——West of Webb City the Whitworth land is being developed by R. B. Tyler for coal, lead, and zinc. At present the coal is being mined where veins from 5 to 15 ft. deep are found. The coal is good grade and finds a ready market at the mine. Later the ores of galena and zinc-blende will be developed at the lower levels.——West of Carthage the Tri-City Mining Co. has at last begun production. The phenomenal drill records of last winter attracted the attention of the entire district and its development has been watched. The shaft is now down 187 ft. and the ore is at the present being treated on hand-jigs. A mill is planned for the early spring.

A Joplin Mill.

Joplin, November 20.

LAWRENCE COUNTY.

(Special Correspondence).—General activity increases in the Aurora camp at the extreme eastern end of the district. Strikes have been made recently on the Sphalerite, the Boston-Aurora, Cleveland-Aurora, and Big Bonanza tracts. A large part of the turn-in comes from the shallow mines. About 16 new shafts are being sunk.——The United Zinc Co. has started the pumps at its No. 6 and 8 shafts and will commence work when the ground is drained. The mill on the property has been closed down for ten months, but weekly turn-ins have been made by the sub-leases on the shallow ground.——Practically all the properties in the Sarcoxie camp are active. A shaft is down 200 ft. on the

J. W. Boyd land, west of town, and driving has been started at 160 ft. A concentrating plant will be erected. The ore in this camp occurs from 16 to 160 ft., the shallower runs being mainly silicate, while the deeper deposits are very rich zinc-blende. At a depth of 14 ft. a rich vein of silicate was discovered on the Henry Cale land west of town.——The contract has been let for the erection of a mill on the Cameron lease on the Boyd land. The company has been engaged in developing the tract for the past three years. A large shaft is sunk and the ground thoroughly tested in every direction. The ore is high-grade zinc-blende.

Aurora, November 20.

WASHINGTON.

STEVENS COUNTY.

(Special Correspondence).—At the Butte & Washington mine, near Hall's bridge, east of Kettle river, Fleetwood Ward has let a new contract to drive an adit, which is calculated to tap the vein at 1000 ft. from the portal. It is now in 500 ft. Gold, silver, lead, and copper are found on the property. Recently a large body of lead carbonate ore on the summit of the hill was stripped and found to be high-grade.——The First Thought Gold Mines, Ltd., has completed the foundations and is now installing a 60-hp. gasoline engine, a five-drill air-compressor and other machinery and will use machine-drills in the First Thought mine in future.——The Beecher Gold Mining Co. has completed a two-mile wagon-road, with easy grade, from its new camp at Rockcut, on the Spokane Falls & Northern railway. The manager says that the Company will purchase machinery and install a mill as soon as possible. Timber is available on the ground and also water-rights for milling and camp purposes. The first carload of free-milling gold quartz was shipped to the Northport smelter two weeks ago and is reported to have been very rich. While at Orient I saw some beautiful specimen quartz from the mine, equal to anything of the kind I ever saw in California. The board of directors has decided to drive an adit 225 ft., to intersect the vein at the shaft, at a depth of 115 ft.; also to install a stamp-mill, compressor plant, and a gasoline engine suitable to drive them; also to lay water-pipe for milling and camp use as soon as possible.——The McKinley group, in Pierre Lake district, has been visited by the president of the company, C. F. Wickstrom, of Spokane. He said a hoist and pumping plant will be installed at once, and more machinery added later. The McKinley group consists of 9 claims, two miles north of the Beecher mine. A shaft has been sunk on a narrow vein which is 26 in. wide at a depth of 22 ft. Other veins outcropping on the group are developed only by open-cuts.——The Colonel Peyton group adjoins the McKinley on the north. It is controlled by Northport people, who will install a compressor plant. A new wagon-road is being built from this property down Deep creek, to a point opposite Laurier, a station on the Spokane Falls & Northern railway.——Work has been resumed in the Little Giant mine.——A 75-ft. contract has been let to extend the adit on the Globe mine. Two shifts will be employed.——A mine-car, track, and other equipments have been ordered for the Valley Dew mine.——The management of the Bryan and Silver Cloud groups, near Rockcut, is contemplating the installation of a compressor plant, hoist, and other equipment. W. A. Graves and H. G. Malette, of Rockcut, are the principal owners.

Colville, November 21.

MEXICO.

JALISCO.

(Special Correspondence).—The famous Cinco Minas, in the Hostotipaquillo district of Jalisco, are under option to the Marcus Daly estate of Butte, Montana, and New York for ₱530,000. The purchase is regarded as certain, and it is believed that the deal will be closed within 90 days. Henry E. Crawford, of New York, is representing the Daly estate in the negotiations. The Cinco Minas are antiguas, their development dating back to Spanish colonial days. Several big bonanzas have been found, but while practically all the rich ore has been taken out of the old workings, there is a big supply of milling ore in sight, and it is felt that new development work may uncover other bonanzas. If the deal for the mines is closed a modern reduction plant will be erected by the Daly interests.——Col. Epes Randolph, head of the Harriman interests in Arizona and Mexico, is one of the men principally interested in the purchase of the Certuchena mines in the Territory of Tepic. The deal was made recently by M. P. Wright, of Los Angeles, acting with Sidney D. Kempton, who held on option for the purchase of the properties. The price named is ₱50,000. The mines have been owned for a number of years by Lonergan & Stanhope, an English firm that has been identified with Tepic for a quarter of a century. The plans of the new owners include the installation of a hydro-electric plant and the equipment of the properties with modern reduction facilities.——The Manzanillo extension of the Mexican Central railway has been accepted by Eduardo Prieto Basave, representing the Federal Government, and a mixed train is now in operation between Tuxpan and Colima. The new Mexican Central time-card will go into effect December 1, and on that date the extension will be opened through to Manzanillo. President Diaz has accepted the invitation of the Mexican Central officials to participate in the formal inauguration.——A. J. Vick, a capitalist of San Antonio, Texas, is closing a deal for the San José, Deseada, and Espada mines in the Hostotipaquillo district of Jalisco for approximately ₱150,000. The Deseada and Espada are extensions of the famous Cabrera vein of the Hostotipaquillo district, and are owned by Carlos Romero, of Etzatlan. The owners of the San José are Sr. Romero, Alfred Lundvall, and the San Antonio Mining & Milling Co. In all there are 130 pertenencias. Mr. Vick will personally provide funds for the further development of the properties and the erection of a reduction plant. Edward Thomson, a California mining engineer, is representing the San Antonio man.——Manuel Cuesta Gallardo, of Guadalajara, announces that he is ready to enter into contracts for the transmission of electric power to mines and mills in the Etzatlan and Hostotipaquillo districts on and after July 1, 1909. The Amparo Mining Co., operating in the Etzatlan district, has already contracted with him for 700 hp. Sr. Cuesta Gallardo is the man who has a Federal concession for the utilization of the water of Lake Chapala for irrigation purposes; Federal concessions covering the water-power of the Santiago river for a number of miles; and a State concession for a competing light and power system in Guadalajara. He has entered into a contract with a Berlin house for electrical machinery and equipment amounting in value to more than ₱7,000,000, and this contract is guaranteed by the Mexican Government. It is estimated that from 200,000 to 300,000 hectares (from 494,000 to 741,000 acres) can be irrigated with the water that is taken from Lake Chapala, and under the new irrigation law the concessionaire will receive a subsidy of ₱50 per hectare in addition to the charges collected from land owners. Some machinery is now on the way from Germany, and this will be installed at the site of the initial hydro-electric plant, about 20 miles from Guadalajara, where the necessary hydraulic works have been completed. The building of a transmission line to the Etzatlan and Hostotipaquillo districts will be commenced early in the coming year. With the advent of electric power the Hostotipaquillo district is expected to become the scene of great milling activity. There are in that district great supplies of dump ore that can be profitably treated by modern methods, and the orebodies of the district are of unusual size. There is promise that it will develop into one of the most important milling districts of Mexico.——The Amparo Mining Co., of Philadelphia, is now crushing about 3700 tons of ore per month in its 40-stamp mill. The treatment is concentration and cyanidation, and extraction of from 90 to 92% is secured. It is estimated that the ore now in sight in the Amparo mines is sufficient to keep the reduction plant running at its present capacity for at least ten years.

Guadalajara, November 18.

Special Correspondence.

LONDON.

Dredging in Bolivia.—Nobel Explosives.—Cullinan Diamond.—Subdivision Into Several Stones.—Consolidated Goldfields.—Holdings in America.

A South American gold dredging porposition that has given English shareholders plenty of anxiety is situated on the Kaka river, behind La Paz, Bolivia. The properties were sold by the local owners, the Kaka Mines Co., to an English company called the Incahuara Dredging Co., in the spring of last year. The management is in the hands of John Taylor & Sons, and the engineer on the spot is A. P. Stockings. The English company paid £60,000 in shares and £1000 in cash to the vendors, and issued 35,684 shares of £1 each for cash, which was available for working capital. The directors have apparently not taken sufficient heed of the expert advice available in John Taylor & Sons' office. At any rate, they were unaware of the engineering difficulties that confront the pioneer in the high lands of Bolivia. They had been promised by the Bolivian government that a road would be completed at an early date from La Paz to Caranavi, and from thence to Puerto Pando, between which two places the property is situated. The contract for the construction of this road had already been taken in hand by other parties. It was not long, however, before these people were glad to give up the contract and to hand it to the Incahuara company. Accordingly, the present company took the matter in hand and, aided partly by government grants, completed the road to Caranavi in February last. Then came the second difficulty: A dredge had been built by Lobnitz, of Scotland, and on general principles the component parts were made as small as possible, so as to facilitate transport in sections. But it was found that the dredge was even then far too heavy, and the engineer is now exercising his wits with the problem how to get the dredge to its destination. A good many of the parts could not be cut into smaller pieces, owing to the absence of sufficiently skilled labor to put them together again. So the pieces not suitable for mule transport have to be laboriously hauled up the road to Caranavi, and it is hoped that the rest of the journey can be effected on rafts. Unfortunately, the company has come to the end of its resources, and another £20,000 is required. The original vendors are very keen that the work should go forward, and have voluntarily surrendered 20,000 of their shares, and the directors and shareholders in this country will probably take up these shares and so provide the necessary funds. I give this case as an instance of the fact tnat the engineering problems connected with dredging operations are but little understood in this country.

There is a strong probability that the Nobel explosives factory, in South Africa, will suspend operations before long, or at any rate the output will be considerably curtailed. The cause of this policy is the fact that the explosive factory owned by the De Beers interests has secured a nine years' contract for the supply of dynamite to the principal Rand groups. The Nobel factory is situated at Modderfontein, and is owned by a company called the British South African Explosives Co. The De Beers factory is at Somerset West, in Cape Colony, and is owned by the Cape Explosives Works. In 1903 the leading mines on the Rand agreed to purchase one half of their explosives for a period of seven years from the De Beers factory. Now that the new contract provides for the whole of this business, instead of half, the factory at Modderfontein is hit hard.

Though many statements have appeared from time to time in the press relating to the final form to be assumed by the famous Cullinan diamond, nothing authentic has been published until this week. This diamond was found in the Premier mine, in the Transvaal, in January, 1905. Its weight was 3025 carats, and it measured 4½ by 2¼ by 2½ inches. The previous largest diamond known was the 'Excelsior', which was found at Jagersfontein and weighed 971 carats in the rough. After much speculation as to what to do with the stone, the Transvaal government, which has a 60% interest in the mine, decided to present it to King Edward VII, and it was accordingly handed to him as a birthday present on November 9, 1907. On January 23 of this year it was sent to Joseph Asscher & Co., of Amsterdam, for the purpose of cutting. This work has now been completed. The stone was of blue white color, of fine quality, but as there were certain flaws in it, considerable study was required in order to get the best results in cutting. Altogether nine stones of notable size have been obtained from it, together with 96 small brilliants, weighing in the aggregate 7⅜ carats, and a quantity of unpolished bits weighing altogether 9 carats. The most important of the stones is a pendeloque or drop brilliant, weighing 516½ carats and measuring 2.322 in. long and 1.791 in. wide. The second stone is a square brilliant weighing 309$^{9}/_{16}$ carats, measuring 1.771 by 1.594 in. Even this second stone is far larger than any other cut diamond in existence, the largest hitherto being the 'Jubilee' diamond, weighing 239 carats, and still in the possession of the Diamond Syndicate. The celebrated Koh-i-noor is only 106 carats. The third stone cut from the Cullinan is a pendeloque weighing 92 carats, and the fourth a square brilliant weighing 62 carats. The other five stones are of various shapes and weigh 18⅜, 11¼, 8$^{9}/_{16}$, 6⅝, and 4$^{9}/_{32}$ carats, respectively. All these stones are of the highest quality and are absolutely without flaw. An innovation has been made in cutting the two large ones; usually a brilliant has 58 facets; in the case of these two stones the number of facets is 76 and 66, respectively.

An interesting document has been issued by the Consolidated Goldfields of South Africa, relating to the company's shareholdings. As a rule a parent company of this nature does not find it advantageous to disclose its business, and the decision to adopt this policy has been accordingly received with special attention. But the curious part about this schedule is that it is incomplete, for, after enumerating 40 companies in which the Goldfields holds shares, the statement winds up thus: "In addition to the above, the company holds shares and debentures in various companies which on quotations of June 30 last, or estimated value, represent a further value of £239,000." It is thus disappointing not to be able to find out what stake the Goldfields has in the Dunderland Iron Ore Co., the Tywarnhaile Syndicate, or the Russian Goldfields Corporation, to all of which I have referred recently in these columns. These companies do not appear among the forty, so are presumably lumped together with others. However, in spite of this carping criticism, the list of specified investments is one of great interest. The largest interests are still in South Africa, and consist of large blocks of Simmer, City Deep, Knights Deep, Jupiter, Robinson Deep, Simmer Deep, Turf Mines, and others. The Simmer & Jack mine is a close rival with the Robinson (not the Robinson Deep, referred to above, but the Robinson of the Eckstein group) as the premier gold producer, both yielding about 26,000 oz. per month, and the Jupiter is of interest at present, as it has just started crushing. Among outside investments specified in the list there is included 24,013 shares of £5 each in the Yuba Consolidated; 12,589 shares of £50 each in the United States Smelting, Refining & Mining Co.; 56,625 shares of £5 each in Oroville Dredging; and 6585 shares of £1 each in Spassky Copper (Russia). It is of interest to note that H. H. Webb, the company's consulting engineer, during his recent visit to America obtained a number of new investments for the company.

John Henry Holman died at Camborne on November 4. To Cornishmen the name of Holman is a household word. The deceased's grandfather Nicholas was associated with Richard Trevithick. His father founded the engineering works now owned by Holman Brothers, Ltd. He and his brother, James M. Holman, for many years carried on this business, which under their direction increased rapidly. He also had many interests in Cornish and other mines,

and he was a public-spirited man in connection with municipal work and the affairs of the church. He was stricken with illness three years ago and never recovered. He had just completed 55 years.

MEXICO.

Ameca and Etzatlan.—Revival of Mining.—American Capital Invested.—El Favor.—Los Reyes.—Casados.—Virginia & Mexico Co.—Candelaria Resumes.

At last the country west of Guadalajara, particularly around Ameca and Etzatlan, in the State of Jalisco, seems to be obtaining the share of attention it deserves. For several years the only really large operators in all that district were the MacKeevor Bros., working the El Favor in Hostotipaquillo, north of Etzatlan, and the Amparo Mining Co., working the Santo Domingo mines, just south of Etzatlan. The latter for a long time has been a large producer, and for over a year has had its 100-ton cyanide mill in successful operation, while the MacKeevors have given their entire attention to El Favor for over two years in development work and the testing of the ores, until about a month ago, when an order was placed with Chalmers & Williams for the first unit of ten 1000-lb. stamps, Wilfley tables, and Frue vanners, with tube-mills and cyanide vats, all of which should be delivered early in January, 1909. With the exception of a few American companies, such as the Casados Mining Co. and the Virginia-Mexico Co., the other operators have been Mexican, of which the more important are the San Pedro Analco Mining Co., of Guadalajara, and Mololoa, of Carlos Romero, Etzatlan, both really important producers that may be considered as being in Hostotipaquillo, although San Pedro Analco lies considerably to the northeast and Mololoa to the northwest of Hostotipaquillo. But now that the Marcus Daly estate has entered the Etzatlan district by purchasing the Cinco Minas, just east of Hostotipaquillo, for ₱600,000, and Daly's former associate, Patrick Clark, has taken over the Magistral, near Ameca, it is certain to attract outside capital to this region. This must result in great good during the coming year, for there are many properties between Guadalajara and the west coast that simply need the capital to make of them excellent producers, and the rapid extension of the railroads from Guadalajara and the leadership of Daly and Clark are going to prove the incentive for further investigation and investment in western Jalisco and Tepic. On the newly acquired Cinco Minas the Daly interests will undoubtedly build an ample cyanide-plant as soon as the necessary tests and experiments can be made, and for the copper ores of the Magistral it is probable that Mr. Clark will erect a large concentrating mill, more or less on the plans of the former owners, who contemplated a 100-ton mill with the Sutton-Steele dry tables. At the properties of the Los Reyes Mining Co., at Los Reyes, near San Sebastian, for which the Daly estate was negotiating but could not come to terms, all production has been cut off, and for the next four months the underground work will be limited to the development of the mine, and the lixiviation plant has been closed down to allow for the installation of a 25-ton cyanide plant, which will shortly be increased to 200 tons capacity if the results from the small plant are as satisfactory as the laboratory tests have led the company to believe. The San Pedro Analco, above mentioned, is changing from the patio to cyanidation, and will erect a 500-hp. hydro-electric power plant below its dam on the Santiago river. The Tajo mines and tunnel, also controlled by the MacKeevor Bros., with L. C. Malone in charge, continue developing the high-grade silver ore struck about 500 ft. from the mouth of the adit in September, and a 10-stamp and cyanide mill has been ordered from Chicago, which should reach Etzatlan, for transport to the properties at San Sebastian, before the end of November. The Casados, near the Mololoa, northwest of Hostotipaquillo, is making a fine showing in 50-oz. silver ore, and W. R. Ramsdell, of Etzatlan, president of the company, is in the States for the purpose of contracting for a 25-stamp, concentrating, and cyanide plant. The Virginia-Mexico M. & S. Co. is putting in a 300-kw. electric power-plant for operating the new mill, which consists of 30 stamps, 10 Wilfleys, crushers, compressors, mechanical agitators, sand belt-conveyors, etc. The Pennsylvania Copper & Gold Mining Co., near Ameca, is preparing to put in a 100-ton concentrating plant, and George McCormack is said to have sold his Zapote copper mine, just south of Ameca, through L. C. Grace, to Mexico City people for ₱25,000. The Palo Quemado, Ampliación del Palo Quemado, and Productora, in Hostotipaquillo, have been bought for ₱40,000, by R. L. Mayfield, of Shreveport, La., who is also interested in the Aztec Queen (known as the Huicicila mines), which is planning for a 400-hp. hydro-electric plant for mines and mill on the Compestela river, and for which the concession has been obtained. Spokane capital has taken over for ₱50,000 the Maturaña, in the Mascota district, which has a splendid old record, and work will be resumed, with T. P. Harsh as general manager. In the Bautista and Parnaso districts, south of Ameca, it is stated that Monterrey capitalists, headed by Vicente Ferrera, have

State of Jalisco, Mexico.

invested ₱250,000 for valuable mining interests. And 115 miles southwest of Guadalajara, on the Zapotlan branch of the Mexican Central railroad, and about 18 miles east of the station of Zapotiltic, another Monterrey capitalist, Andres Garza Galan, has proved up a good body of coal under some 2500 acres, with indications that the field covers over 6000 acres. Surveys are already being made by E. D. Cruise, former engineer for the Southern Pacific, for a railroad from Zapotiltic. In Tepic, the Certuchena, on the proposed line of the Southern Pacific, and owned by Louergan & Stanhope, of Ixtlan, has been purchased by Epes Randolph for ₱50,000, and J. P. Casey has been placed in charge. Plans are being drawn up for a mill and a hydro-electric power plant.

In the northern part of Chihuahua the resumption of work is announced on the properties of the Candelaria Mining Co., at San Pedro, on the Rio Grande, Sierra Madre & Pacific railroad, under the management of George A. Laird, of Smith & Laird, Bisbee, Arizona. The properties consist of the San Pedro, Candelaria, Congreso, San Nicolas, Leon, Porvenir, and San Benigno. Already some 300 men are at work, and operations will at first be confined to the Candelaria, Congreso, and San Nicolas. Considerable unwatering and sinking will have to be accomplished before production on the required scales can be undertaken, for it being a large lead proposition of medium grade, it will be Mr. Laird's endeavor to obtain the largest possible production with the most economical handling, and his experience at the Victoria mines, in San Luis Potosi, and the Sierra de

Cobre mines, in Cananea, have taught him the handling of large tonnage. Automatic devices will be used where possible, and a switch will run from the San Pedro station to the mines, a distance of a mile and a half. Shipments should begin before the end of January, 1909.

PARRAL, MEXICO.

Less Production.— Cause of Decline. — Character of Ores. — Minas Nuevas.—The Tecolotes.—El Rayo.

Parral and Santa Barbara shipped 15,000 tons of ore and concentrate in the month of October; this is a large decrease from the normal production. The fall in the price of silver and the depressed financial conditions are chiefly responsible. While nearly all the ores carry lead and gold, the silver content is the dominant and controlling factor. The grade varies and it is difficult to arrive at an average, but ore running 800 grams silver, 15 gm. gold, and 7 to 30% lead may be considered typical of the shipments. In general ores running 500 gm. silver, or lower, cannot be shipped profitably and the mines contain a considerable tonnage of this grade. These ores usually run high in silica, and contain no base metals that cannot be removed by concentration. The gold is finely disseminated through the gangue, and the silver occurs mostly as a chloride, but in some cases as argentite. Ore of this grade and character is found in such mines as the Prieta, Palmilla, El Porvenir, Esperanza, Veta Grande, and Sierra Plata, though all of these have ore of a higher grade than is being shipped. With this condition of the district well-defined, the proposal to cyanide the low-grade ores is receiving most favorable attention. Experiments made on ores of the Minas Nuevas confirm the opinion that it will be possible to revive mining operations by resorting to cyanide treatment of such silicious ore as cannot be shipped while silver remains at its present price. A custom plant for this kind of mill-work seems to be in demand. The El Porvenir, which has the old San Cristobal vein, is taking steps to erect a cyanide plant. Its ore consists of silver chloride and gold in quartz, with apparently little of the base metals. The El Rayo, situated 10 miles north of Santa Barbara, is successfully operating a concentrating mill and cyanide plant on a silicious sulphide ore that runs $15 in gold and $1.25 silver per ton. The base of the sulphide is iron and 40% of the total extraction is obtained from Frue vanners, 60% of the total being cyanided. The El Rayo operations are dissimilar to those proposed for Parral proper, in that the former has to deal with an ore that is principally gold-bearing, while the latter has an ore essentially silver-bearing and low-grade. So far as the base contents of the two ores are concerned, however, the problems are nearly similar. The Tecolotes, situated close to Santa Barbara, has suffered no curtailment in its production during the past year. It has a complex low-grade ore, which is reduced in the ratio of 6 to 1 by concentration. Approximately, it contains 3 gm. gold, 200 gm. silver per ton, 7% lead, 8% zinc, 7% iron, some copper, 42% silica, and 8% lime. The mill, built in two units, has been operated steadily during the year, concentrating an average of 20,000 tons of ore per month. The crushing department consists of crushers, rolls, and Huntington mills; the concentration is performed by jigs, Wilfley tables, vanners, and canvas tables. The highest silver-lead product is made by the jigs. One set of tables makes a lead concentrate that runs higher in gold and lower in silver than the jig product; another set produces an iron-copper concentrate that carries gold and silver. The vanners make a lead product and on the canvas is obtained a fine concentrate running high in gold but low in silver and lead. A middling, thrown off the Wilfley tables, consists of zinc, copper, and iron, aggregating 40 or 50 tons per day. A large tonnage of this material has accumulated and a plant is to be erected to treat it. The plan is to roast the stuff in a shaft-furnace, to magnetize the iron, and then pass it through magnetic separators, obtaining a valuable copper-iron concentrate, as well as a zinc product. The International separators are likely to be installed, experiments having been made here with one of them. W. M. Drury, general manager of the Tecolotes mines and mills, states that he contemplates installing tube-mills for re-grinding the vanner tailing, the re-ground product to be concentrated on vanners and then passed to the canvas plant. Harry Cooper is mill-foreman. The mill is operated by electric motors, the plant consisting of seven American Crossley gas-engines, which drive the electric generators. The gas-producer plant, supplying either wood or coal gas for the engines, has operated satisfactorily. The air-compressor, mine-hoists, and all other machinery on the property are operated by electric power. The mill receives ore from the Coyote, Tecolotes, and San Albino mines. Some stoping is also being done in the La Seca. This company also operates the Palo Blanco, from which shipments of 15 cars per month are being made of high-grade gold, silver, and lead ore.

Tecolotes Mine, Santa Barbara, Chihuahua.

A brief outline of the El Rayo may be of interest, as it is one of the successful mines of the district. The principal vein strikes north on a contact between rhyolite and diorite, having a dip of 50 to 65° west and an average width of 4 ft. The gangue is both quartz and silicified country rock. It is opened by three levels, which enter the vein at practically the same elevation, making 6000 ft. of drifts on the strike of the vein, with a great amount of stoping above and some winzes below the main adits. The southern part of the mine is known as the Descubridora, the middle as the El Rayo, and the north end as the Adela, each part being entered by a main adit. The Descubridora and El Rayo portals are at nearly the same point and the ore is hauled to the mill from both over the same surface tramway; another surface tramway from the Adela conveys the ore from that mine to the mill. While there are three main adits, the workings are all connected. The two air-compressors, of Sullivan make, are at the El Rayo. Sullivan drills are used for driving and the Waugh for stoping. The output amounts to 120 tons of ore per day, all of which is milled. The concentrator has one set of roughing rolls, two sets of fine rolls, five Huntington mills, the latter having 50-mesh screens. The rolls and Huntingtons operate in cyanide solution. The pulp from the Huntington mills passes to 16 Frue vanners, which do all the concentration.

The tailing passes to the cyanide plant, in which the sand and slime are cyanided separately. In the mill are eight Wheeler grinding-pans, which are to be used for re-grinding the sand. First, Merrill cones will be installed to separate the sand from the slime as the pulp passes from the Huntingtons; the sand will then be re-ground to 80 mesh, the slime to pass directly to the agitator-vats. The re-ground sand will go to the vanners and the vanner tailing to the sand-vats for leaching. The solution in the slime-vats is strengthened by the addition of cyanide and then the whole contents are pumped to the Butters filters. After the solid material is discharged from the filters, the solution is passed to the sand-vats, where additional cyanide is introduced. Finally the gold solution is drawn from the sand-vats, passing through a cone where zinc dust is added, thence to a filter-press in which the precipitate is collected. Here follows J. S. Colbath's system of discharging the solution from the press and subjecting it to zinc layers in boxes. He uses no acid treatment. Bert Peterson is general manager, with G. V. B. Leving as assistant manager, and J. S. Colbath, metallurgist.

BUTTE, MONTANA.

Standard Oil Interests in Copper.—Utah Consolidated. — The Anaconda Fire.—Serious Problem.

For some time the report has been current that interests allied with the Amalgamated and Cole-Ryan concerns had secured control of the Utah Consolidated, one of the big low-grade copper mines. The report is followed by an official announcement that the directors of the Utah Consolidated had authorized the making of a new 10-year contract for the treatment of the company's ores, to take effect upon the expiration of the existing contract with the Garfield plant of the American Smelting & Refining Co. It was stated that by the terms of the new contract the Utah Con., without the investment of any capital, would save $300,000 per year over the expense of treatment under the existing contract, and the company would not be put to the expense of building its own smelter. At the time the new contract was made it was not intimated that the contract was given to new interests, or rivals of the American Smelting & Refining Co., but it developed later that John D. Ryan and Thomas F. Cole, closely allied with the Amalgamated Copper Co., represented the new interests in the Utah Con., and that they will build a new smelter for the treatment of that company's ore. They have taken over the land options held by the Utah Con., and it is stated that the new interests have also obtained control of the company itself. The new smelter will cost several million dollars, and is to be one of the largest and best equipped in the West. It will be large enough to handle the ore of other Utah companies. The extension of Amalgamated and Standard Oil influence in the copper industry is gradual, but very sure.

For nearly twenty years the fire in the Anaconda mines has been a serious problem; it has again made necessary a temporary suspension of operations in the Neversweat and Anaconda workings, which adjoin and connect. The fire started in the St. Lawrence in 1889 and has been spreading and burning continuously ever since. Some years ago the mine was flooded and the fire driven to such a small area that it could be walled in and controlled. Much of the fire territory has since been mined, but the shifting ground, due to the extraction of ore, has frequently in the past two years opened cracks and allowed gas to escape, making mining impossible until the mines could be cleared of the fumes and the leaks sealed again. Some time ago the management considered it safe to mine some large pillars of ore that had been left as a wall against the fire. About a week ago the fire became so intense in the vicinity of the No. 9 air-shaft that the flames broke into the shaft and flared above the mouth of it. The flames were soon extinguished and no damage was done to the shaft itself, but a steady stream of sulphur smoke and fumes issued from the burning copper sulphide ore. A week later the fire broke out unexpectedly on the 1600-ft. level of the Neversweat. Three horses were suffocated and the men were driven out of the mine. The Anaconda mine, on account of the gas in the shaft of that property, had been mined through the Neversweat, but with the outbreak of fire in the latter it became necessary to close the three connecting mines. The fire situation is a serious one.

JOHANNESBURG, TRANSVAAL.

The Greatest Gold Producer.—Mill Construction. — Gold Production. —Rock-Drill Trials. — Mine-Signal Recording. — Centrifugal Pumps.

At the meeting of the Langlaagte Deep, Ltd., Louis Reyersbach referred somewhat mysteriously to the company's possible participation in "a combination of interests in its immediate neighborhood," and further aroused public curiosity by suggesting that the mooted amalgamation, if carried, would "create the largest individual gold producer on the fields, though by no means the one possessing the largest mining area; at the same time it will ensure to holders highly satisfactory returns for an almost indefinite period of time." In making this claim, Mr. Reyersbach had, of course, in his mind a scheme of consolidation resulting in the formation of a single company exceeding in yields and profits the recently united East Rand Proprietary. This company, with 820 stamps employed, is crushing 140,000 tons per month for a yield of £220,000 and a profit of £120,000. In American money, these returns may be placed at $13,000,000 and $7,000,000 per annum, in round numbers. It is not surprising, therefore, that speculation should be rife as to the exact scope of the newly proposed amalgamation which is to surpass these records. Rumor has it that the mines involved comprise the Crown Reef, Crown Deep, South Rand, Robinson Central Deep, Langlaagte Deep, and Paarl Central. The South Rand, now in the shaft-sinking stage, will certainly be united to the Crown Reef, whose 'mynpacht' section is nearing exhaustion, and whose 120-stamp mill is near the South Rand shaft. That the Crown Deep should enter the scheme also appears to stand in the normal order of events, for its workings have already been extended into the South Rand on the dip, while the Robinson Central Deep has always been closely allied with the Crown Deep. As the Langlaagte Deep has been definitely stated to be a candidate for membership, this mine may also be placed as a certain unit. Analyzed on these grounds, it would appear that Rumor presents a reasonable case. On the basis of present performances, the group would record the following results:

	Tons Milled per Month.	Yield.	Profit.
Langlaagte Deep	39,655	£52,124	£17,486
Crown Reef	24,600	40,392	21,013
Crown Deep	40,460	69,973	40,100
Robinson Central Deep..	32,300	67,798	45,971
Totals	137,015	£230,287	£124,570

These aggregate yields and profits do actually exceed those of the East Rand Proprietary, without taking into account the possibilities of expansion involved in the amalgamation. That the Paarl Central will also contribute is a further factor supporting Mr. Reyersbach's prediction as to the pre-eminence of this great consolidation of interests upon the West Central Rand.

A feature about a small new mill being designed for the Bantjes Consolidated is that it will be equipped with an independent amalgamating room, situated apart from the battery. The advisability of this scheme in general has long been intermittently considered, but this will be the first installation embodying the principle. The several advantages claimed for the erection of the tables in some independent division must always include in first importance the reduced opportunities for theft. The losses of amalgam by theft are very great upon the Rand, although the matter is not ventilated as loudly as in Western Australia, where tellurides also provide valuable grist to the

mill of the I. G. B. profession. In connection with amalgam stealing, it may be incidentally noticed that upon many of the mines an effort is being made to supplant native employees in the reduction works by whites, if not exclusively, as much as possible.

The practice of working on day-shift only underground is proving successful upon two or three of the leading mines. Not only is a saving effected in power costs—when the plant installed happens to be capable of meeting all requirements during the reduced time—but advantage is taken of the superiority of work performed by the men during the day-shift. Of course, the scheme is quite inapplicable to the majority of mines wherein high-pressure work for two shifts is necessary to keep the mills supplied. In those mines which have adopted the principle of single-shift mining, shoveling and tramming is still undertaken by day and night.

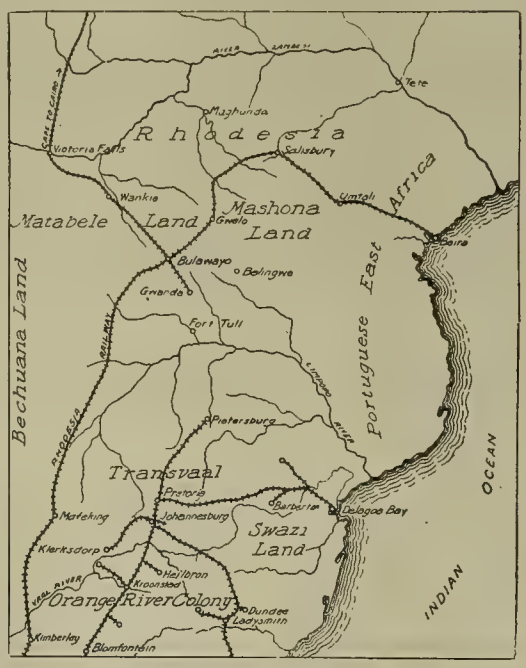
The rate of gold production in the Transvaal continues to advance. Returns for September balanced, within 200 ounces, the output for August, although a short month. The total for the nine months compares with the yields for the last five years as follows:

1903	£12,589,248
1904	16,054,809
1905	20,802,074
1906	24,579,987
1907	27,403,738
1908 (9 months)	21,917,698

The figures for the nine months, viewed in the light of probable immediate increases, show that the 1908 aggregate will approximate £30,000,000. Of the Transvaal total, the Rand accounts for about 96.5 per cent.

Just as certain portions of the Rand or certain minerals sought in the outside districts come in for waves of popularity in the stock market, so do particular devices or subjects enjoy a 'boom' of debate in technical circles. At the end of last year and the beginning of this, the stope-drill—notably as a substitute for hand-labor in case of shortage—was the foremost and almost exclusive topic. Before referring to the questions now largely before the engineering world, it may be well to refer once again to the issue of the stope-drill contest, details of which were freely published in the American technical press. It may be recalled that the *South African Mining Journal* organized a contest, which included several types of 'baby' drill and was won, hands down, by the Gordon hammer drill. This machine, weighing only 72⅝ lb., attained wonderful speed records, and proved itself so greatly superior to its rivals throughout the trials, on surface and underground, that the highest hopes were formed of its successful introduction throughout the Rand. Unfortunately, the greater test of many months' practical adoption under divers working conditions has now proved that it is quite incapable of maintaining the high place won under perfect trial conditions, in the hands of an operator deemed one of the most highly skilled adepts on the field. It has failed owing to 'fitchering' troubles and to excessive wear and tear. But because the *South African Mining Journal's* enterprise resulted in giving the laurels to a drill not suitable, in its present form, to Rand conditions, it does not follow that effort has been wasted. On the contrary, it provided an admirable dress rehearsal for the greater contest to be held next year under the ægis of the Government and Chamber of Mines, when the danger of misinterpreting wonderful test-showings will be more easily avoided.

At the present time, Rand technical literature is being enriched by a number of ideas dealing with all questions of communication between mine and surface. Telephones and systems of bell-signaling are being discussed in several aspects. Last week a paper was read before the Transvaal Institute of Mechanical Engineers, describing a new device for the automatic recording of mine signals and also of the winding operations. It is intended to act as a safeguard in providing an absolute check upon all signals given, call or reply, and as a useful record of work done and time taken. The inventor refers to it "as a strict and independent arbiter in all disputes which may arise in connection with the winding apparatus, and remaining at all times a friend to the good and honest workman." The apparatus, which has been in use for six months at the Langlaagte Block B mine, comprises a simple clockwork arrangement, carrying, upon a small cylinder, an endless paper band, which is marked by a needle whenever a signal is transmitted. This traveling chart is sectioned so that the time of recording is known precisely. A disc indicating the revolution of the hoisting drum is brought in contact with the paper by means of an electric circuit automatically made and broken by a switch operated on the centrifugal principle from the crank-shaft of the engine. No extra wiring is necessary for the application of this recorder, which can be placed, if desired, in the manager's or engineer's office. Such a check upon signaling and hoisting must certainly have a beneficial influence upon all concerned, though perhaps it may be considered somewhat severe upon the engine-driver. A paper read by Mr. Kestner, also before the Transvaal Institute of Mechanical Engineers—soon to be aptly re-named the South African Institution of Mechanical Engineers, with, probably, corresponding members of council in the chief industrial centres of the sub-continent—has turned afresh the thoughts of Rand technical controls to the applicability of high-lift centrifugal pumps for mine drainage. Generally speaking, our pumping problems have been of no peculiar difficulty. The day of the time-honored Cornish pump is passing with the general increase of depth exploited, but it is early yet to say that such popular units as electrically driven three-throw plungers are on the road to the scrap-heap. It has been realized that this field is favorable to the centrifugal scheme, as opposed to plungers, in that power is cheap and skilled labor costly—the latter consideration being important when the greater wear and tear in the parts of any reciprocating machine are noted. Certainly the plunger pumps attain a high efficiency, but maintenance costs are also high. Mr. Kestner's paper, which puts the case for centrifugals (chiefly favored on this field for light service around the reduction plant) in the most favorable aspect, will no doubt lead to further comparative investigations. It may be mentioned that in the Kimberley diamond mine Cornish pumps (employed to a depth of 1800 or 1900 ft.) were followed by motor-driven three-throw plungers, and then by centrifugals; these are reported to give the highest satisfaction.



Map of the African Goldfields.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Lumber cut in the United States in 1907 was 7% greater than the cut for 1906.

The United States is the greatest producer of copper; then Mexico; then Spain.

Eight pounds of water evaporated per pound of coal is an average performance.

The Miocene ditch, at Nome, was built by W. L. Leland, William Bliss, and G. M. Davidson.

The fuel value of dry wood is approximately proportionate to its weight, irrespective of the species.

A nautical mile, or knot, as adopted by the U. S. Coast and Geodetic Survey, is equal to 6080.27 feet.

The miner's inch represents a flow of 1.5 cu. ft. per minute; and the term 'sluice head' represents a flow of 60 cu. ft. water per minute.

In pyritic deposits, the content of copper shows a gradual decrease in depth. This is true of Rio Tinto and Tharsis, in Spain; also of typical deposits in Norway.

Naturalization of a father operates to make citizens of only such of his foreign-born children as are under 21 years of age at the date of the parent's naturalization papers.

The copper from the Boleo copper mine, in Lower California, Mexico, is sold at Swansea and Dunkerque on the basis of the average price six weeks before and after arrival of the shipment at the refinery.

A floating crane of 150 tons capacity has recently been built in Germany. The barge carrying the crane, a boiler, and an electric plant for operating the crane, is 150 by 60 ft. and 13 ft. deep. The height of the crane above the deck is 230 feet.

Re-location, used in the correct sense, is the act of making a subsequent location differing from the previous one in the position or size of the claim, while an amended location is made to correct an error or errors in the legal papers used in the previous act of locating.

The genesis of the Mt. Lyell copper deposit is attributed by Gregory to metasomatic replacement in crushed material along fault-planes. The pyritic minerals of the schist are secondary, and there is evidence that the ore has been formed after the schist was foliated.

The principle of the storage battery was discovered in 1801, by Gautherot, who experimented with platinum electrodes immersed in a salt solution. However, it was Gaston Plante who, about 1860, produced a battery having sufficient capacity to make it a commercial possibility.

Along the coast of the South Island of New Zealand there is an enormous accumulation of auriferous gravel, up to 300 and perhaps 500 ft. thick, capped in places by glacier drifts, which, having been intersected by more recent streams, have supplied a large quantity of gold.

There is no invariable association of copper and any particular igneous rock. Diabase in New Jersey, granite in Montana, are examples. Igneous contacts with limestone are favorable. Copper is found in sandstone in many regions, such as Russia, Germany, Bolivia, and Central Africa.

Sulphate of lime is the worst scale-forming constituent of boiler feed-water. To test for its presence, add a little chloride of barium to a few cubic centimetres of the water. If a white precipitate is formed which will not dissolve on the addition of a drop or two of nitric acid, sulphate of lime is present.

Electrolytic iron always contains hydrogen in varying quantities, according to the conditions under which it is deposited, and the more hydrogen it contains the greater is its hardness. The hardest varieties will scratch glass. Iron highly charged with hydrogen is very inert, and not readily attacked by acids.

In the ordinary mechanical jig a speed of 300 rev. per minute is about the maximum, with a minimum stroke of, say, 2 to 4 mm.; and even with this, there is much strain on the parts and corresponding wear and tear. The regular beat of the plunger causes too great a rush of water, and that carries upward the minute particles of ore.

Pure hydrogen manufactured with a simple apparatus and from non-bulky materials, is the achievement of recent French experiments. Fine aluminium filings are mixed with a small proportion of mercuric chloride and potassium cyanide, which causes a slight rise of temperature, and produces a coarse powder, quite stable if kept dry. This powder is treated with water, about 1 litre to a kilogram, and the temperature, as the hydrogen is evolved, is kept below 70° C. by the addition of more water. At that temperature 2¼ lb. are completely oxidized in two hours, and yields 44 cu. ft. of pure hydrogen.

Serpentine is unknown in crystalline form, always occurring massive, in spite of its possessing a definite chemical composition. Chemically it is the magnesium salt of di-silicic acid, its formula being $H_2Mg_3O_3 \cdot Si_2O_5 \cdot H_2O$, showing it to be a hydrous orthosilicate. The formula is generally simplified to $H_4Mg_3Si_2O_9$. The mineral has a hardness of 2.5 to 3. It is smooth, and has a greasy feel. The color is usually a shade of green, sometimes brown and white. Specific gravity, 2.2 to 2.7. It is always secondary, resulting from the alteration of silicates containing magnesia, such as olivine. The alterations may be illustrated by the following equation (after Pirsson):

Olivine + Water + Carbon-dioxide = Serpentine + Magnesite

$$2Mg_2SiO_4 + 2H_2O + CO_2 = H_4Mg_3Si_2O_9 + MgCO_3.$$

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Explosion in Compressed-Air Main.

The Editor:

Sir—Referring to my letter appearing in your issue of August 22, on the subject of an explosion in the compressed-air main of the Tonopah Mining Co., I wish to present some further facts concerning the explosion. It may also be of interest to mention the causes of such explosions, together with the precautions for preventing trouble of this kind, that were considered by our management after an investigation of the Mizpah explosion, and a thorough discussion of it. No serious claim for originality is made. Such authorities as were obtainable were freely consulted; Peele's new book, 'Compressed Air Plants for Mines', being especially helpful. I shall refer to the explosion in our plant as the Mizpah explosion.

The plant in question consists of two 2-stage compressors, one a Fulton compressor, cylinders 25 and 15 by 18 in., running 120-125 strokes per min.; the other an Ingersoll compressor, type D2, cylinders 22¼ and 14¼ by 18 in., running 120-125 strokes per minute. Both compressors have unloaders of the throttled intake type, are water-jacketed about the cylinders, and have inter-coolers between the low and high compressioned cylinders. At the time of the explosion the compressors were connected with two 4 by 10-ft. receivers, one for each compressor, and the two receivers were connected to the main. Since the explosion a receiver, 6 by 16 ft., has been added to the system.

The explosion took place on the evening of a fair day, at 6:30 p. m., about 45 minutes after starting the compressors. It occurred in the 6-in. main, between 100 and 400 ft. from the receivers. The explosion was violent, and burst open most of the pipe between the 300-ft. level and the surface. The woodwork in the shaft to which the pipe was fastened did not show any scorching, thereby indicating that this portion of the pipe was not excessively hot at any time prior to the explosion. The usual working-pressure is 90-95 lb., but at this time it was only about 80 lb. The compressors were known to be working hot, but as no thermometers were in use it is not possible to state the temperature. In the attempt to improve conditions, the cylinder-oil being used was changed to one having a higher flash and ignition-point, but even with this oil, combustion, but not explosion, has occurred in the receiver attached to the Ingersoll compressor.

Among the unfavorable conditions under which the plant works are the following: An atmospheric temperature frequently in the neighborhood of 100° F. during the summer; an altitude of 6000 ft.; and an Ingersoll compressor designed for sea-level. The Ingersoll compressor was installed first, later the Fulton was added, and various other minor additions were made from time to time as their need was felt; consequently the plant lacks the uniformity of design it would have had if it had all been installed at one time.

The cause of this kind of explosion is obviously the presence in the system of an inflammable gas, or possibly dust, mixed with air in such quantity as to render it explosive. The presence of an inflammable gas may be accounted for in several ways:

1. It may be generated from an oil of low flash and ignition-point by a not unreasonably high temperature.

2. It may be generated from an oil of high flash and ignition-point by an excessive temperature.

3. It may be generated by high temperature from a tarry deposit of partly destroyed oil, carried over from the compressor. This is sometimes deposited in the pipes or receivers of compressors.

Among the ways of accounting for the presence of fine carbonaceous dust are:

1. Dust from outside sources, such as coal-dust from the blacksmith shop, drawn through the intake. This would probably be insufficient by itself to cause explosion.

2. Smoke generated by over-heating of oil or tarry deposits. This would doubtless be accompanied by gas, and may be considered as a part of the gas, as far as its effects go.

Ignition of the explosive mixture may have originated, in the Mizpah explosion, in the following places:

1. In the main where the explosion occurred. This seems improbable. The timbers show no charring such as would be caused by hot pipes.

2. In the receiver. This seems possible.

3. In the pipe between the compressor and the receiver. This seems possible. It is here that a black sooty or tarry deposit is sometimes found.

4. In the cylinders or in the outlet pipe, due solely to a sudden increase of temperature caused by leaky or sticking valves, improper unloading devices, or by an outlet-pipe choked with carbonaceous deposit.

Wherever ignition occurred, it may have been caused by the catalytic action of a porous deposit of carbon, even though the general temperature were not high enough to ignite the gas under ordinary conditions. To quote from Ostwald's 'Chemistry': "The oxidation of many substances by free oxygen is greatly accelerated when charcoal is present. . . . Gases which under given conditions act only slowly on one another can be made to act more quickly with the help of charcoal."

If ignition occurred in the compressor, or in the outlet-pipe to the receiver, or in the receiver, we must account for the explosion occurring only in the main and not in the receivers. I would explain this by assuming that the receivers were filled with a mixture of gas and air in such proportions as to be inflammable but not explosive; that the mixture was explosive only in the main, and that combustion of the gas in the receivers was comparatively slow, in the nature of a flare, and served to transmit ignition to the mixture in the main. In a letter on this subject, Prof. Edmund O'Neill says: "The most favorable mixture is about one part of oil vapor to seven

parts of air. As the proportion of oil vapor or air recedes from this proportion the violence of the explosion diminishes until there is no danger either way. The most violent explosion may occur with less air or with more air, according to the composition of the gas." From this it will be seen that we can have a gas-and-air mixture spread throughout the receivers and pipes, varying from a merely inflammable mixture in one place to a highly explosive mixture in another place. The heat of the flare would raise the pressure in the receiver and thus increase the pressure of the mixture in the main and render its explosion all the more violent.

It is the purpose of the company to carry the investigation further. To this end, recording pressure-gauges have been attached to the compressors, and it is planned to insert thermometers, some of them self-recording, in various parts of the system. By these means we shall be able to record the temperature and pressure under all conditions. It is also planned to have the lubricating oils tested, and to watch the amount and kind of deposits left anywhere in the system. By these means we hope to ascertain the causes of trouble in our plant and to avoid them.

The precautions deemed advisable are as follows:

1. First, where possible, a well designed plant, built for the altitude in which it is to operate. With a sea-level compressor working at a high altitude, too great a proportion of the work is thrown on the high-compression cylinder. Under this heading come the following details:

(a) Intake-pipe of wood and taking air from a place outdoors as cool and as far away from dust-producers, such as the blacksmith shop, as possible.

(b) Unloader to be of a design that will not cause excessive heating when the compressor is partly unloaded. Some unloaders, especially of the throttled-intake type, seem to have this tendency.

(c) Efficient intercoolers.

(d) After coolers between the high-compression cylinder and the receiver, on a compressor that shows a tendency to overheat. This would tend to prevent the transmission of ignition into the receiver, even though gas were formed, and the gas would not ignite spontaneously in the receiver if cooled before getting there.

(e) Efficient water-coolers, where water must be used over again.

(f) Inlet to receivers to be at their top, and outlet about a foot above the bottom. This will insure the air entering the main being clean, and the coolest in the receiver.

(g) Blow-off cock at bottom of receiver.

(h) Check-valve between compressor and receiver. This may save the compressor in case of an explosion or flare in the receiver.

(i) Recording thermometers and pressure-gauges.

2. Use the best oil obtainable for the purpose, and as little of it as is consistent with proper lubrication. It would seem that a good oil, with as high a flash and ignition-point as can be produced with the necessary fluidity, would be the most desirable; for a poor oil would doubtless furnish the condition for explosion at a lower temperature than a good oil.

3. Use well regulated oil-cups with sight feed. If oil is fed in excess of the requirements of the pistons, it will accumulate in the cylinders, when they are unloaded, as there is no opportunity for it to be blown off with the air. In machines where overheating is apt to occur, this gives a favorable condition for gas production.

4. Clean the outlet valves once a week.

Referring again to my letter of August 22, I wish to correct the statement in it regarding an explosion in California of a compressor belonging to the Standard Oil Co. My information on this subject was hearsay, and I have since been informed on good authority that there was no such explosion in any of the Standard Oil Co.'s plants.

J. A. Burgess.

Tonopah, Nevada, October 22.

Standardizing Engineering Publications.

The Editor:

Sir—The important consideration to the specialist, in any branch of engineering, is how to make his store of information, his professional notes and the works of others, readily accessible, that the information may be called to hand when needed with the minimum expenditure of time and effort. Time, which is a fixed element, is a most valuable asset; effort spent otherwise than in productive work is force dissipated. The specialist, in order to practise successfully, must have his knowledge and his working information so marshalled that they constitute a treatise in his branch. How best to accomplish the economical collecting and filing of notes and information becomes an important question. The object of this letter is to suggest a step in the direction of improving the conditions under which we work.

The record of current practice in engineering, the examples of recent construction, and the presentation of scientific data and research are made through the following mediums:

1 Publications in book form.

2. Technical periodicals, published weekly or at other short intervals.

3. Technical magazines, published monthly or at longer intervals.

4. Publications of the engineering societies and scientific associations.

5. Publications and reports of the various departments of the Government.

6. Reports of public commissions, and municipal and State officers.

7. Information spread in pamphlet form, from miscellaneous sources.

8. Trade and manufacturers' catalogues and bulletins.

We depend upon practically all of the above sources to keep abreast of developments in any particular line of work. It is difficult to designate which is the most important; perhaps the technical paper has the broadest usefulness because it reaches the widest field. The plea of this letter is for a standardization of the size of the pages for all publications, in order that information upon a special subject printed in any one of the forms may be segre-

gated from the balance of the matter contained in a particular issue and filed separately in a special binder. There is some question as to the advisability of including books, as such, in the list, for their form makes it impracticable. The objection does not hold, however, against the remaining seven styles of publications. The prevailing loose-leaf form of notebook, as developed lately, points unmistakably, by its extreme usefulness and flexibility of adoption, to the wisdom of advocating its extension in the field here considered.

It is realized that to advocate a step so extreme as this will call forth protests from many interests, and it may provoke the risibilities of some. To bring out a discussion upon the soundness and desirability of the idea is the first consideration. If it be deemed sound and useful, then the concerted effort of the members of the profession can be used to promote ways to make it practicable.

Referring first to the technical paper, it is made from a standard sheet of paper, ordinarily 24 by 36 in., 26 by 38 in., 36 by 48 in., or 36 by 52 in. dimensions. These sheets when printed, cut, and folded make pages of various sizes. To illustrate, there was found recently on a table in a certain office the following enumerated papers:

Periodical.	Net size of page.
Power	9 by 12 in.
Electrical World	9 by 12 in.
The Foundry	9 by 12 in.
The Engineering and Mining Journal.	9 by 12 in.
Engineering-Contracting	9 by 12 in.
The Architect and Engineer	7¼ by 10½ in.
The Iron Age	8½ by 12⅜ in.
Mining and Scientific Press	8¾ by 12¾ in.
Engineering Record	10¾ by 13¾ in.

The list is presented as one taken at random. Of the mining journals, five are 9 by 12 in. and the remainder, with one exception, approximate those dimensions closely. To carry out the idea of standardization to its useful end, the sheets should be cut in assembling so that each is bound singly within the covers. The familiar wire-clip can be used as at present for fastening the sheets, after which the back can be gummed. When the journal is in the hands of the subscriber it can be punched for loose-leaf binding with the ordinary desk form of punch, brass fasteners inserted with the thumb put in place, and the wire-clips may then be removed. Having put the journal in this shape, articles on particular topics may be removed at will to the special binders.

The objections to adopting the idea will come primarily from the publishers. The probable objections will be discussed briefly: a technical journal is, from the standpoint of the publisher, a medium for the display of advertising. The revenue from advertising must carry the paper or it ceases to be published; practically all the news-print of today derives its existence from that source. The advertiser who is displaying his goods to the engineer and to the trade is the factor to consider. By careful analysis of the situation, it is seen that he will be the one to gain the greatest benefit from the changed conditions, for it must be admitted that the value of nearly all advertising matter is lost as it is handled now. The advertising presented to our review is not of the class shown on the city bill-board where a new brand of whiskey is being exploited, which advertising is treated as a public nuisance; on the contrary, it is a positive and definite assistance in keeping abreast with new developments. When a manufacturer calls attention to a new type of dredge, a new gear-cutting machine, or to a tape of a new metal whose coefficient of expansion and contraction is almost a negligible quantity, he is doing the profession a service and the matter is eagerly read. Immediately his advertisement is slipped from among the leaves of the journal and is filed in the binder reserved for that particular topic. The files under the head of 'dredges' are as quickly filled with the advertising showing the various types of, and the names of the various manufacturers of, dredges as they are with subject-matter on performances. Is the advertiser the loser thereby? It can hardly be conceived how such could be the case when by one stroke he gains the point sought in all efforts toward publicity: that of having the constant attention of the particular public sought to be interested. Is the publisher going to lose custom? Not when the customer finds that his advertising is being treated in this more intelligent manner, is being filed systematically, and indexed for ready reference.

It is felt that if a movement could be started to bring the technical papers to see the great advantages, both to themselves and to the profession and the trade, of a sheet of standard size, it would require less effort to induce other publishers to follow that lead. The Government probably would be hardest to move in this respect. The publications and reports of the various departments contain vast stores of knowledge and research, which it is the avowed purpose of the Government to disseminate broadly. How limited is the circle reached! When an engineer moves his library, the books, papers, and pamphlets he generally leaves behind are the Government 'tracts'. These, if had in another form, would be carefully preserved.

J. H. G. Wolf.

San Francisco, November 12.

[The reading matter on each of our pages covers a space of 7⅛ by 11, while that on the 9 by 12-in. page occupies 7 by 10 inches. The reason for adopting the size of 8¾ by 12¾ was to give the Mining and Scientific Press the proportions of a book: the 9 by 12 dimensions give a shape so nearly square as to be extremely ugly when the issues are bound in a volume at the end of each half-year. Another reason for making the Mining and Scientific Press different in size was to make it distinctive, departing from a 'standardization' that involved the idea of using this form of trade literature solely as a lure for advertising. Except *The Iron Age*, the other periodicals mentioned are mostly syndicate papers, forming part of enterprises controlled by speculative publishers, to whom the reading matter is merely an adjunct to attract advertising display. The Mining and Scientific Press is unwilling to become one of the standardized syndicated trade-papers, and emphasizes the fact by a difference in shape and type.—Editor.]

DREDGING ON THE SEWARD PENINSULA.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

No less than 65 dredges have been built and operated for the extraction of gold from the gravel deposits of Alaska and the Yukon. It cannot be said that either the Canadian territory or its American neighbor afford a proud record in this branch of alluvial mining. Of the 65 dredges mentioned, at least 35 come under the category of 'things to avoid,' for they were mechanical eccentricities, in the contemplation of which there is as much pathos as humor; in the construction of them the ignorance of their designers was joined with the most superb disregard for all previous experience. Of the 30 dredges remaining after the foolish schemes are subtracted, 18 failed on account of faulty construction, frozen ground, or lack of gold, as well as from sundry other difficulties common to human industry, such as poor management, unskilful operation, accidents. Thus there remain 12 dredges that are rated as successes, both technical and financial. It would be invidious, if not dangerous, to particularize further, but for the present purpose it may be said that only one out of these 12 successful dredges is on that romantic, spacious, and rich peninsula named after the Secretary of the Interior associated in history with the transfer of Alaska from Russia to the United States.

Anyone desiring to obtain an epitome of dredging on the Seward Peninsula has but to take a stroll in the environs of Nome, especially along the meandering estuary of the Snake river. On the shores of that serpentine expanse of brackish water there lie stranded several abortions (Fig. 1) that at one time or another were doubtless heralded as 'gold ships' of assured promise. Incidentally, never invest your money in a dredge that is labeled a 'gold ship'; it is a term invented by a sophomoric reporter, and employed by the incubators of wild-cats. A dredge is not a ship, but a strong machine placed upon a scow, so that the digging of the bank of gravel, and the extraction of the gold, may proceed concurrently and continuously. That is just what the derelicts on the banks of the Snake failed to do; if they did any digging, the amount was small and spasmodic; if they saved any gold, the quantity was insignificant and insufficient. Several dipper-dredges, with paddle-wheels at their stern (Fig. 2 and 3), decorate lugubriously the shore of the lagoon west of the city of Nome. To an Oroville man they would seem like the nightmares of a distempered dream. There are also sundry steam-shovels, some of them of inexplicable design, and as well fitted to operate in gravel deposits as to prepare ground for planting cabbages. Around the bend of the Snake river, near the Wild Goose pump, I saw a washing plant joined to a steam-shovel, a relic from the boom days, and a suggestion that experience may be disregarded as long as the gullibility of mankind endures. In this locality, half a dozen dredges are within sight at one time, not counting wrecks the real character of which wind and weather have obscured. Of all the machines in the Snake estuary, only one was at work during my stay at Nome, and this was operated for only a few days. I refer to the Wisconsin dredge (Fig. 4), owned by Bursick & Co., of Cleveland, Ohio. This machine was shipped to Nome in 1900, and in September of that year it was thrown by a big storm far inland upon the tundra. The buckets are of 3-ft. capacity, and resemble in shape and size an ordinary fire-bucket; they are attached to a flimsy sprocket-chain. The revolving screen is made of wire, and discharges to one side upon a belt-conveyor extending rearward along the upper deck so as to reach beyond the stern for a distance of 20 ft. The fine gravel passing through the screen flows along 60 ft. of sluice-boxes, and descends into an iron chute. The nominal capacity of the dredge is 1200 cubic yards; the actual capacity when at work is 400 to 500. On September 7 this dredge was being laid up for the winter, not because the season was ended, but by reason of a break-down. The spud was smashed, several sprockets were broken, and the machine was in trouble generally. No wonder; it had been operated on ground that had been leased and was supposed to contain thawed gravel. The ground had not been drilled or otherwise tested. As soon as the open-connected bucket-line of infantile design 'bucked' the frozen ground, something had to yield—and it was not the gravel frozen to the firmness of granite. There is a touch of humor in the remembrance that this Wisconsin dredge, owned in Ohio, is at least nominally connected with two States that manufacture some of the best dredging machinery ever built, and if the gentlemen at Cleveland care to use such ancient contraptions as this Wisconsin dredge, it is not for lack of accessibility to something better.

One of the tributaries of the Snake river is Bourbon creek. This is a depression in the coastal plain north of Nome; it forms a shallow little valley that has been the scene of several attempts at dredging, most of which are associated with the name of Powell. During the past summer a large dredge started to work in this locality, and furnished another sad commentary on the lack of wisdom exhibited by people usually rated as of more than average intelligence. I refer to the enterprise of the Nome Mining Co., controlled by several well known officers of the United States Steel Co. This dredge has proved a fiasco. Nor were warnings lacking. Along the bottom of Bourbon creek, both above and below the big new dredge, there stood several mute witnesses to human stupidity in the form of dredging devices of archaic design. Some idiot evidently thought that he had got hold of an idea overlooked by engineers versed in this branch of mining, the fact being that his idea had been thrown on the scrap-heap of discarded inventions more than ten years ago.

When I first saw the Bourbon Creek dredge (Fig. 5) it lay with its back broken, under water, for an accident had happened a few days after the first start. The full extent of the injury was not known, but it was expected confidently that repairs could be made rapidly, and that a successful run would follow ere the close of the short season. The dredge

was stated to be a copy of 'California No. 3', at Oroville, but this is incorrect, for 'California No. 3' is a 7½ ft. Marion machine of excellent design. The Bourbon Creek dredge has buckets of 9 cu. ft. capacity, close-connected, and was assembled by E. L. Smith; the machinery was supplied by the Taylor Iron & Steel Co. The nominal capacity was 120,000 cubic yards per month, and it was expected that 3000 yards per day would be dug. The cost of the dredge is stated to have been $97,000, and the power-plant adjoining, $115,000. At a first glance it appeared that the hull was too weak for the digging machinery, and the gantry too light for a dredge of such power. Also the washing apparatus seemed inadequate to cope with the supply of gravel raised by the buckets. The gravel is small, it is mostly what dredge-men call 'chicken feed'. More than 50% of the material raised by the dredge passed through the ⅜-in. holes of the screen, as against 20%, the proportion more usual in California. In consequence, the washing-tables were crowded. The screen is 6 ft. diam. and 32 ft. long, giving 27 ft. of screening surface; yet it was not big enough for the purpose intended. The chafing-beams are horizontal along the sides of the well instead of being placed vertically; in consequence, the buckets in their swing tend to strike the chafing-beams and to pull them off. Something of this sort caused the accident, the bucket-line being allowed to sag so as to strike the side of the pontoon when the dredge moved into a new position. The hull was torn and the water entered, drowning the dredge. The tumbler is made wholly of manganese steel, instead of the wearing parts only. When the tumbler wears, the worn part cannot be replaced and the whole casting must be scrapped. This is an inadvisable deviation from modern practice. The bucket-line is operated by a gear-drive from a motor placed on the tumbler-gantry above the deck, the result being to suspend unnecessary weight upon timbers subject to vibration. These are some of the criticisms prompted by an examination of the dredge, and the sequel proves the fairness of them, for after making sundry repairs and re-floating the dredge, another worse accident followed forthwith, so that the effort to operate was abandoned, pending the re-building of the machine and the engagement of a man able to direct the operation.

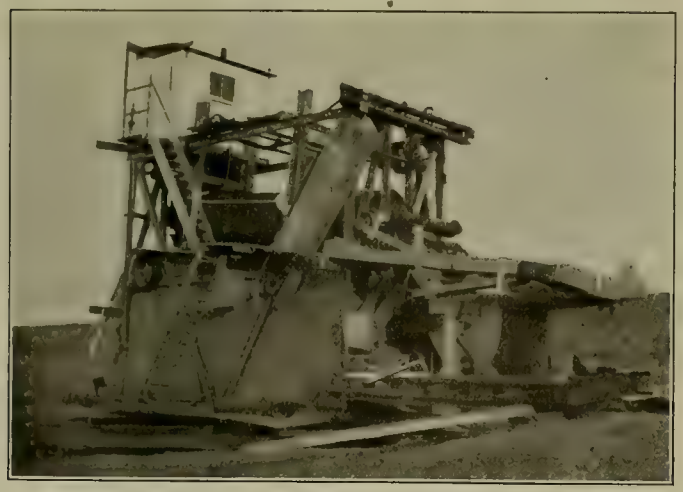


Fig. 1. A Dredge-Man's Nightmare.

It is worth while to tell the story of this fiasco, not to hurt the feelings of anyone concerned, but as a warning likely to be needed in the course of the next two or three years, when I expect to see many new dredging enterprises started in the North. On careful enquiry, I ascertained that the first trouble was due to inexpert handling of the dredge. The flotation was insufficient at the start, and the dam was too low. Soon after beginning work the dredge dug into an old drain (wooden conduit), and this allowed the water in the pond to escape; the dredge was laid on the ground with one end overhanging, so as to "put a crimp" in the hull. After the dam was repaired, refilled, and the dredge re-started, the ladder had a heavy side-pull and the slack chain was dragged against the side of the well, tearing a hole in the pontoon. This caused the boat to sink one side first, and, the ladder being then on the bottom, the whole weight (600 tons) of the dredge was thrown upon the end of the ladder, breaking the heavy steel casting within three feet of the lower end. The back brace of the bow-gantry was cracked. When digging, the deck was under water; evidently the hull was too small for the machinery it carried. The dredge did not cost enough; a first-class machine of this kind, even with 7-ft. buckets, would cost $110,000 at Oroville, California. An efficient and strong dredge with 9-ft. buckets and washing apparatus to equal the digging, ought to cost at least $150,000 at Nome. Too much of the money was invested in the

Fig. 2. Stern-Wheel Dredge.

steel and not enough in either the hull or the head of the manager. The man in command was an engineer from the iron mines of Minnesota, wholly inexperienced in gold mining. Knowing nothing of dredging, it might be supposed that he would go to Oroville or Marysville and engage a capable dredgemaster; instead, he placed an electrician in charge. Whatever defects the dredge may have had, these were magnified by unskillful handling.

Dredging is usually preceded by drilling. The Nome Mining Co. owns 43 claims, the defunct dredge being on No. 6 Below Discovery. I was informed that 200 holes were drilled, the plan being to drill 9 holes per claim of 20 acres in that part of the property likely to be dredgeable. The average yield was given to me as 78 cents per cubic yard, and the record indicated that the gold was distributed in layers at intervals throughout the vertical section. The log showed that gold was found all the way down, with enrichment at 10 and 20 ft., and also just above bedrock itself. The bedrock is soft schist, well adapted to this kind of mining. The poorest drill-hole yielded at the rate of 13c. per yard. The depth of digging at the site of the dredge was 35 ft., and the top of the tundra forming the bank of the creek was 20 ft. higher. On some of the property the depth to bedrock was as much as 80 ft., and the drill-record showed an average of $1.17 per yard in this deep ground. The lowest average for any one claim was 31 cents. Although the holes ranged in depth from 28 to 80 ft., the average yield was obtained by adding the weight of the gold extracted from the different holes and dividing the sum by the number of holes. This is a childish error. Moreover, the log shown to me was not such as to inspire confidence; it was in bad order and exhibited errors in the calculations. Even the manager knew so little about the character of the ground he expected to dredge as to tell me that F. G. stood for 'frozen ground' when it meant 'fine gravel', the idea of 18 or 20 ft. of frozen ground being enough to dismay even a 'tenderfoot'. On the whole, this enterprise exhibits all the blunders it is possible to make in dredging; if you must make it certain that failure will result, then place the testing of the ground in careless hands and allow the records to become muddled, build a cheap dredge with an expensive power-plant, hire a colliery engineer or an architect to manage the affair, and let him place an electrician in charge, so that the last chance of success may be eliminated. Then go ahead cheerfully and expect miracles to happen.

The Bourbon Creek dredge is within half a mile of the town of Nome. About three miles farther north, and in the first watercourse to the west, is another dredge, in course of construction. This is on Wonder creek. It is a substantial machine, and represents the re-modeling of a double-lift dredge that was built to operate on Nome river. It is not likely to be completed before the close of the present season.

On September 3 I visited Ophir creek, about 85 miles southeast of Nome, and in the course of that journey saw several dredges. Upon No. 1 Below Discovery on Ophir creek, the Blue Goose Mining Co. is operating a dredge that was originally erected in 1905 on the Niukluk river, near Council, and dug its way up that river and up its tributary, Ophir creek, for a distance of four miles, to the present site of operations. The dredge has buckets of 5 cu. ft. capacity, close-connected, turning over a hexagonal upper tumbler and a pentagonal lower tumbler. The buckets empty into a hopper, lined with steel plates, and thence the material passes over a sluice 4 ft. wide and 22 ft. long provided with cast-iron (Hungarian) riffles. Here as much as 90% of the gold is caught. Then come two shaking screen-tables, made of perforated plates, each 14 ft. long and with a movement in opposite directions. The perforations are ⅜ and ⅝ inch, successively. On the screen-tables there are obstructions or stops (made of cast iron) so as to retard the flow of the gravel and disintegrate any clay. The shaking-screens have a 6-in. stroke, and the eccentrics run smoothly. Water is raised to the head of the top sluice by a 10-in. Morris sand-pump, which also elevates the drip from the 'save-all' in the well. The dredge is digging 14 ft. under water; there is no bank above water except an occasional foot or two of old tailing from early ground-sluicing operations.

On the very evening of my arrival a serious accident happened, necessitating a complete stop to digging. Three of the teeth of the main driving-wheel were broken; a fragment of a tooth had become caught by the pinion, and this had cracked the cast-iron rim of the driving-wheel itself. The large wooden spud was shattered. But it took only three days to complete the repairs. A new spud was available and replaced the shattered remnants of the old one. The broken teeth were replaced by three stub teeth or pegs fitted into holes drilled into the rim of the driving-wheel and riveted firmly in place. Two steel bands (on each side), and another underneath, strengthened the cracked portion of the driving-wheel and made it stronger than before. These bands were riveted through the rim. Of course, the main gear-wheel of a dredge should not be made of cast iron, but it must be remembered that this was an old machine, and those in charge had to do the best they could. And they did well. I would like to see the same superintendent and crew in charge of a standard dredge.

The accident was due to frozen ground. When anything goes wrong with a dredge in the North, *cherchez la glace*! The experience of the last two seasons has proved that there may be from 6 inches to 6 feet of frozen ground, usually well above bedrock. The driving-wheel had been cracked three times, and on each occasion it was repaired as described. The last accident was due to an encounter with frozen gravel, then dropping the buckets into unfrozen bedrock, so that the buckets struck the frozen ground in their ascent. This frost is not original, but is due to pools of stagnant water left in old workings, for the dredge is working the site of early diggings. Originally the entire creek was thawed naturally, as is frequently the case where water runs, and the surface was covered with scrub willows—an

unfailing sign of unfrozen ground. The secondary frost, due to formation of ice from the freezing of water in old workings, is not so hard as the original frost, that is, the glacial condition characteristic of the surface throughout the North, except in creek-beds. Powder is used to shatter the frost under the top dirt. In the spring a way was cleared for the dredge by blasting the ice formed in old wing-dams, and it was expected that the water brought to the spot by a ditch would assist in thawing the ground; but this expectation was not fulfilled: the ice was broken rather than dissolved, and in places the ground was re-frozen. Next season it is intended to work a face 500 ft. wide, and remove the overburden down to frost (1 to 6 ft.) for a distance of 18 ft. ahead of the face. By the time the dredge returns to the end of a cut, the gravel will have thawed a couple of feet, enough to facilitate another move forward. There is said to be difficulty in using steam-points in ground partly thawed because the drill-hole chokes before the point can be put in position to be of service. There has never been a day this season that this little dredge has not worked ground partly frozen, though the first 'perpetual' frost was that struck on the day of my first visit, when the spud and bull-wheel were broken. It was all due to one small spot that had not thawed, although all around the ground had softened. The bedrock itself was soft enough to be dug under the layer of frozen gravel. These details are worthy of record, for insistence upon them will serve to remind the reader of the great obstacle to dredging in the North. The obstacle is not insuperable, by any means, but the attempt to ignore it constitutes the main reason for so many fiascos in dredging.

Fig. 3. A Dipper Dredge.

Before giving figures relating to the operations of the Blue Goose dredge, I wish to refer to the arrangements for washing the gravel.

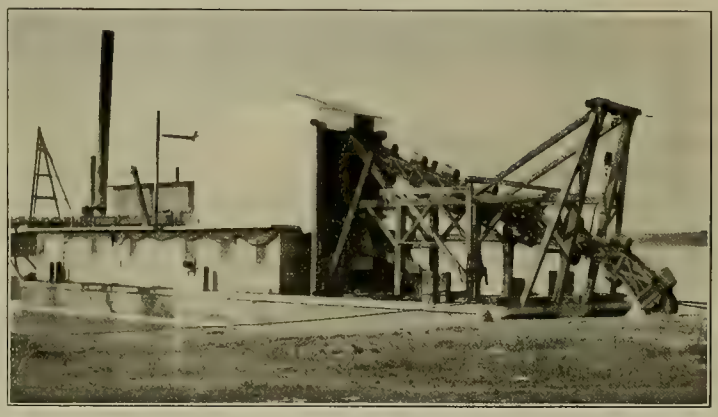


Fig. 4. Wisconsin Dredge.

These are excellent. As previously stated, as much as 90% of all the gold saved is arrested by the cast-iron riffles in the first sluice. In mining, always catch your gold as soon as you can; never depend upon a second operation or device if the first will do the trick. In shooting ducks it is best to get your bird with the first barrel and not depend upon the second, even though it be choke-bored, for by that time the duck may have flown out of range. As the bucket empties into the hopper, a heavy vertical jet of water plays upon it, so as to ensure the washing of any fine gold adhering with clay to the bottom of the bucket. This jet is used only when washing bedrock, and the flow of water is controlled by the winchman. As the gravel passes from the top sluice onto

Fig. 5. Bourbon Creek Dredge.

the shaking-screens it is retarded by the stops already mentioned, and in its passage it receives the strong spray under 20-lb. pressure, issuing from ¾-in. pipe drawn down to ½-in. nozzles. These jets overturn the flat pieces of bedrock and wash the gravel free from clay, to which particles of gold may adhere. A second row of jets lower down repeats this process. It can be noticed that the jets of the last row have the effect of arresting the flow of material, so as to send the water through the screen, while the tailing reaches the belt-conveyor (of the stacker) in an almost dry condition.

When working full time this dredge raises 1000 cubic yards per day. It digs from 1 to 4 ft. of bedrock, which is a soft schist. On the pontoon there is a machine-shop, smithy, and mess-room. The crew take their mid-day meal on board, and when the dredge is at work they must feel like the passengers on a Yukon steamer aground. During the season of 1907 this dredge worked for 110 days. The actual running-time represented 69% of the total time. The ground excavated represented 98,718 cu. yd.; the total expenses were $31,672, and the value of the gold extracted was $83,144. Therefore the average yield was 84 cents and the average cost 32 cents per cubic yard. The season of 1908 will show about the same costs, but a better yield of gold. The fuel consumed is wood, at the rate of 10 cords per day, at $10 per cord delivered. The total costs as given above include all repairs, equipment, and general expenses. The dredge cost $28,700; it was a small and poorly equipped machine, therefore repairs entail $5000 each season. The manager is G. H. Russell, and the president of the company is Jafet Lindeberg. To both these gentlemen I am indebted for more than the usual frankness and courtesy.

On the way from Ophir creek to Solomon, in the valley of the Solomon river, I saw several derelict dredges and one that was in action. This was near the mouth of Big Hurrah creek; it was a small machine, actuated by a gasoline motor, and it was coughing loudly under the strain of laborious digging. At Oro Fino, near the mouth of Shovel creek, on the Solomon river, two dredges are in operation, both of them important enterprises. The Nome-Montana-New Mexico dredge had started only a few days before my visit, and was hardly working to its normal capacity. It is a Risdon machine, with open-connected buckets of 5-ft. capacity, turning over a quadrilateral top tumbler and a pentagonal lower tumbler. The stacker is a close-connected bucket elevator, the buckets being shallow, like pans. The revolving screen is sectional, 4½ ft. diam. and 26 ft. long. There is 240 square feet of gold-saving tables and in addition there are side sluices. Cocoa-nut matting is laid under riffles of expanded metal, as is customary on dredges built by the Risdon Iron Works. It is a good gold-saving device. The bow-gantry has a strong square frame, capped by a steel I-beam. This dredge is not new; it was built in 1905 for a company operating on Cook's Inlet, the machinery being moved and placed upon a new hull. The present owners control 110 acres of dredgeable ground on the Solomon river. At the time of my visit the buckets were coming up nearly empty, the dredge was digging in hard limestone, and seemed to be laboring under difficulties. Gerald H. Hutton, a capable dredge-master from New Zealand, was in charge. This dredge, overloaded with hyphens and struggling with hard bedrock, did not give an immediate impression of success. It seemed not to be strong enough, and the question arose why the owners of the ground had not asked the Risdon foundry to make them one of their most modern dredges, instead of employing a second-hand machine. I learned that J. P. Pearson, the promoter and general manager, considered that he was getting a bargain. The hull is new, and the dredge was made ready in the record time of 50 days. While it was bucking into hard limestone at the time of my visit, further enquiry proved that the dredge-master was cutting into the rim-rock in order to make room preparatory to turning the dredge. For the first two weeks the yield was poor for this reason; after September 6 the dredge began to dig in profitable gravel. While the start was not made until August 24, there were 55 days of actual operation up to October 19, when the season ended. The dredge dug 42,000 yards of gravel in 49 days, at an operating cost of 14.6 cents per cubic yard, burning only 4 tons of coal (at $21.75 per ton) in 24 hours.

A hundred yards away, the Three Friends dredge was emitting steam and ejecting broken limestone with a cheerful regularity that suggested profitable exploitation. I approach the description of this enterprise with keen pleasure, for this is the one perfectly sane, sound, and successful dredging operation on the Seward Peninsula. It was organized by W. L. Leland. Mr. Leland, a Californian accustomed to the atmosphere of practical mining, was one of three men that built the Miocene ditch. The "three friends" were Frederick H. Rindge, Charles A. Giffen, and W. L. Leland. The dredge cost $118,000. It is modeled after the 'Exploration No. 2' at Oroville, and started to work in June, 1905. The buckets are of 5 cu. ft. capacity, close-connected, with a 12-in. lip. The capacity is 3700 cubic yards per day. Washing of the gravel is effected on a tabular shaking-screen, built in two sections, one lapping over the other and moving contrariwise. The upper section is 7 ft. 5 in., and the lower 7 ft. 9 in. wide. Each is 14 ft. long. Owing to the overlap, the total working length is 24 ft. This screen-table is made of ½-in. hardened steel-plate, punched with holes, tapered and tempered. The openings gradate from $^{3}/_{16}$ to ½ in. diam. Strong jets of water play upon the gravel as it travels down the shaking-table. Owing to the absence of clay, the shaking screen proves thoroughly efficient. The tailing is dry and clean as it falls upon the belt of the stacker. The stacker is a belt-elevator moving at the rate of 280 ft. per min. Saving of the gold is effected by means of Hungarian riffles, in three tiers (2½ by 7½ ft.), arranged in zigzag immediately underneath the screen. The effect is to interrupt the flow of the material and to arrest the movement of the gold before it reaches the side tables, where more riffles are in service. No cocoa-nut matting is used.

The bucket-line is actuated by a driving-gear that is double, so as to equalize the strain on the tumbler-shaft. Both the upper and lower tumblers are provided with wearing-plates of manganese steel, in order to avoid the necessity for scrapping the entire casting (that costs $8000) when it becomes worn. A pneumatic riveter and chisel has proved a great convenience for repairing the buckets.

Movement forward is effected on the spud, the dredge swinging by its side lines while digging. When a cut is completed, the bucket-ladder is pulled up, the dredge 'steps' ahead on the spud for a distance of about 6 ft., and the buckets start digging into the surface. At the end of each swing, over an arc of 100 to 125 ft., the ladder is dropped sufficiently to permit the buckets to take another cut of

The Three Friends Dredge.

Solomon River, Alaska, Showing the Three Friends and the Nome-Montana-New Mexico Dredges at Work.

2 ft. out of the bank. At the time of my visit the dredge was digging to a depth of 16 ft. This is clean gravel, for the cover of surface dirt does not exceed one foot in depth. By courtesy of Mr. Leland, the dredge was stopped while our party[1] examined the tables under the electric lights. The deposit of gold, some of it amalgamated but much of it free, was of the most encouraging character. On ascending to the upper deck and watching the operation of digging, we obtained an idea of the nature of the operation. It was highly creditable to the builders of the dredge. At this time the buckets were digging into a limestone, removing 18 in. to 2 ft. of the hard rock. The fragments in the buckets looked as if they had passed through a rock-breaker. It is the practice to dig into the bedrock until the dredge refuses to go deeper, no attempt being made to force it beyond the limit of safety. On moving to the stern it could be seen that the dredge had been digging in limestone for several days; previously the bedrock was schist. Of the total area to be dredged, 80% is schist. On the tailing-piles I saw chunks of weathered limestone 2 to 3 ft. wide; these lie on the bedrock, the gravel consisting largely of rock similar to the underlying formation, and varying accordingly. When working on hard bedrock, at a depth of 18 to 20 ft., for example, it is customary to have 7 or 8 buckets dragging on the bottom, with the weight of the ladder on top of them, so as to cause them to take hold or bite into the rock. With 7 buckets working thus, there is 16⅓ ft. of effective scraping machinery in operation along the top of the bedrock. The result is that a smooth surface is left in the wake of the dredge, all the gravel and top bedrock being removed completely. Certainly, even to one who has seen a dredge before, it was surprising to observe how the buckets were digging below the weathered limestone into the fresh hard rock.

The property of the Three Friends Mining Co. covers 4000 acres, of which 1400 are being patented and only 70 acres have been worked out, in three seasons. The season is 4 months, plus from 5 to 10 days. The operating cost, including winter expense, is 10½ cents per cubic yard; the total expense, including depreciation, maintenance, and amortization of capital, is 18 cents. The cost for fuel, using 14 tons of coal per day, at $22 per ton, is $8500 per month. The dredge has made a record for steady running, doing better than an average of 23 hours per day for an entire season of over 4 months. Frozen ground has been avoided.

Last spring the dredge encountered a bit of frozen ground where no frost was supposed to exist. It was due to ice formed during the previous winter. In three weeks the lips of the buckets were worn away 3½ inches through their 1½ in. of manganese steel, the toughest metal as yet discovered for such operations. Later in the season this particular place was found to have thawed. It is now planned to work in the willows for 4 or 5 weeks before attacking the river bar. Willows indicate thawed ground. The winter cold penetrates deeper in the clean gravel of the creek than in the débris of the bank. Whatever river-ice survives into the early summer is due to the winter frost, for the creek freezes solid 12 to 14 ft. deep. In tackling the frozen gravel, it was found that the buckets sliced the pebbles, the frozen mass of material being as completely cemented as a conglomerate that has undergone metamorphism. But those three weeks in frozen ground caused as much wear and tear to the dredge as 10 months of ordinary work. The manager knew what he was about; he dug just enough of the frozen ground to enable him to float the dredge and move it forward into the thawed area.

This dredge has worked for three seasons, and while the figures of production are not available for publication, I can state that the profit has already exceeded the cost of the dredge and its installation. A ditch is being built with a view to the erection of an electric power-plant and the construction of another dredge. At present the cost of power represents two-thirds of the total operating expense. In California the cost of power on a dredge is $850 to $1100 per month, in this case it is $8500. The contrast is forcible. Furthermore, the operation of a single dredge is not economical if the area to be worked is large enough to warrant the employment of more than one dredge. The general management remains the same, whether one dredge is operated or more; also the question of repairs is simplified, for the cost of carrying a stock of duplicate parts is shared by the larger number of machines. Mr. Leland keeps $19,000 worth of repair-parts on hand for the existing dredge. Obviously, it is a pity that the two dredges of the two companies operating on adjacent ground were not sufficiently similar in design to permit of the use of identical wearing-parts.

It is pleasant to leave the description of dredging on the Seward Peninsula at this point, for the Three Friends is an enterprise that sustains the belief that dredging is a profitable form of industry if properly undertaken. Mr. Leland spent three seasons in testing his ground by drilling; he supervised the drilling operations himself, and obtained results that were absolutely reliable. Then he went to Oroville, the place where dredging practice was best developed at that time, and ascertained what service different types of dredges had given. Having found the one that was rated as the most efficient, he ordered a copy of it (with minor modifications) to be manufactured by a reliable foundry, and finally he selected men (to erect the dredge and to take charge of it) who had had experience in such matters and had a good record. This procedure seems obvious, and it does not appear to require any special inspiration. Most people hate to spend money in testing their ground, for such work yields no gold; they like to try a new machine, for man ever runs after what is new; they think it proper to put a nephew or a friend's uncle in charge of their affair. Then things happen. I have emphasized the human aspect of my story because it is one that is certain to recur in the development of the North.

[1] C. H. Munro, T. M. Gibson, Jafet Lindeberg, A. E. Boyd, Scott Turner, and the writer.

LA PLATA MOUNTAINS, COLORADO.

Written for the MINING AND SCIENTIFIC PRESS
By R. H. TOLL.

The La Plata Mountain district is one of the Rip Van Winkle mining districts of Colorado that have been asleep for many years and are just attracting the attention of capital. It has been roused a number of times before, but on commencing to stir it has been hit in the eye by some marauding speculator. This time, however, it really seems to be coming back to life, for the steady output of the last few years has demonstrated that it has considerable bodies of rich ore and is really worthy of exploration.

A remote situation, in the southwestern corner of the State, has been chiefly responsible for the lack of interest in the district, investors preferring to spend their money in camps closer to Denver, the remoteness being enhanced by the method of running the local trains. If you go from the north you must spend the night in Telluride; and if approaching from the east you are obliged to lose 16 hours in Durango, although within an hour's ride of the main entrance to the district, and although the trains run through to Silverton without change. This places the La Plata mines one day farther from Denver by rail than either of the chief camps of the San Juan.

The camp is an old one, beginning its existence in 1873, when the discovery of rich ore on the Comstock, on the La Plata river, created an excitement that attracted people from all parts of the country and built up a number of prosperous agricultural communities, though the difficulties of transportation and reduction of ore at that time nipped production in the bud, so that the mining boom gradually faded away. Parrott City, the first town in the county, was built at the portal of La Plata canyon and was for several years the county-seat. The Comstock was gouged out to a depth of 75 ft. and abandoned almost without any development, although the ore was sufficiently rich to be hauled to Pueblo by oxen, a distance of about 300 miles, netting $60,000 to $70,000.

Most of the orebodies so far discovered have been small, but the ores are rich and a number of the mines have made excellent records, which would have created a stampede had any one of them been situated within the bounds of the bustling State of Nevada. The possibilities are illustrated by the fact that the May Day, which has produced more than a million dollars, was discovered only about four years ago within half a mile of Parrott City, on a trail which had been used by prospectors for thirty years. When the prospect was 20 ft. deep, the fortunate finders disposed of the claim for $50,000 and it has 'made good.' Some of the shipments are said to have averaged $1000 per sack.

The La Plata mountains constitute a compact group of high peaks resulting from a domal uplift, which apparently had its centre in Waterfall gulch, at the head of Lightner creek. According to Whitman Cross this upheaval took place in early Tertiary times, but was entirely independent of the San Juan uplift, which preceded. The district covers an oval area 12 to 15 miles in diameter and is cut in all directions by a complicated system of dikes, sheets, and laccoliths, chiefly of acid lavas, such as diorite, syenite, and the intermediate rock, monzonite. The ejection of these masses, causing local uplifts and cracking the sedimentaries, was, of course, one of the principal factors in determining the present topography by influencing erosion; and such peaks as Silver, Lewis, and Mt. Moss, which are wholly or partly laccolithic, stand out prominently as erosion centres, from which the streams radiate with remarkable regularity in all directions like the spokes of a wheel, all ultimately finding their way into the waters of the Colorado river.

South through the central portion of the district flows the principal stream, the La Plata, which has eaten its way by head-water erosion far into the northernmost hills and has built rich placers in the lower end of the canyon and on the level bars at its entrance; but of such depth and containing boulders of such size that they have not been profitable. The highest mountain of the group is Hesperus, 13,225 ft., which is a remnant of the uplift produced by the erupton of Mt. Moss, a laccolith adjoining Hesperus on the north and which shoots out a number of intrusive arms between the sedimentaries of the surrounding hills and tilts the strata so sharply that the Mancos shales, which compose the uppermost peaks of Hesperus, are at least 7000 ft. higher than on the gentle slopes of the Mancos valley and the Dolores plateau, only a few miles distant.

One striking feature of the geology of the district is the absence of Primary rocks. There are no exposures of granite and the only known granitic rocks in sight are limited exposures of schist and gneiss in the extreme portion of the district. By far the larger portion of the mountain area is covered by sedimentary rocks, chiefly of the Mesozoic age, though in the eastern part a few strata of the upper Carboniferous appear. The most important of the sedimentaries are of the Triassic period, the lower member of which (the Dolores formation) is about 2000 ft. thick and appears in all portions of the district. It is made up of calcareous sandstones, siliceous limestones, shales, grits, and conglomerates, generally of a brillant red, owing to the dissemination of a fine-grained pigment of iron oxide and minute crystals of pink feldspar. This formation corresponds to the Red Beds of the eastern slope of the Rocky Mountains.

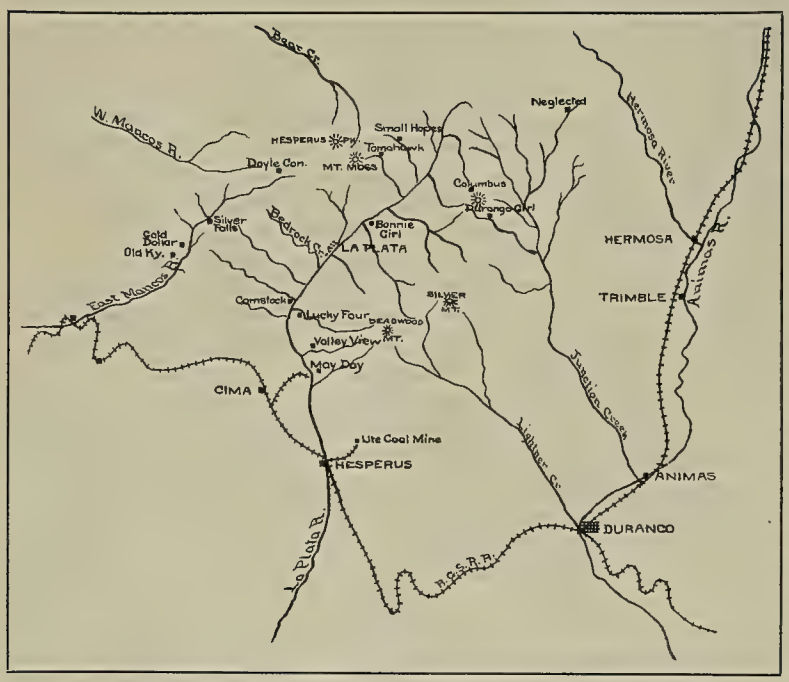
Locally these brilliant hues have been altered by metamorphism and hydro-thermal action to purple, brown, yellow, and dazzling white; and these colors, mingled with the dark-gray of the porphyries and the lighter grays of the stock-rocks, the dark-green of the dense vegetation wherever it can obtain a foothold, the black stripes of shale and the irregular patches of shining black where manganese abounds, impart to these hills a singular beauty. The canyons of the West Mancos and Junction creek present as magnificent scenery as is to be found anywhere in the State.

The lower member of the Dolores is composed

principally of beds of grit and conglomerate, often 30 to 40 ft. thick, very compact and resistant, so as to make a succession of benches and cliffs. The upper member is founded on a succession of sandstones, sandy shales, and fine conglomerates containing pebbles of a peculiar limestone. These pebbles are usually small, being no larger than shot over large areas, and then grading to the size of potatoes. Associated with these beds are a series of gray sandstones and greenish-gray shales, often indurated and metamorphosed to the hardness of flint. These beds are 50 to 100 ft. thick and contain a few fossils of plant-stems; but no well-developed leaves have ever been found. Fossils are uncommon throughout this region and the age of most of the rocks is determined by their association rather than from any direct evidence of fauna and flora of the various periods.

Directly above these shales and sandstones is a formation of such size and importance as to have given it the name of the district—the La Plata sandstone. It is usually nearly white in color, very silicious and of great thickness, forming prominent cliffs, especially at the head of the two main branches of the Mancos river, where the nearly vertical cliffs are 200 to 500 ft. high, broken only where the strongest fissures cut through them. This is of Jurassic age, of which the upper member is composed of the innumerable thin strata of clay-shale of the McElmo formation. Above these lies the Dakota sandstone and the Mancos shale, of the Cretaceous.

Between the sedimentary strata, notably those of the Jurassic period, occur beds of ore known as 'blanket-veins' and 'contacts,' though the latter word means nothing in this case beyond the fact that the joint-planes between the strata have afforded a path for the percolating solutions and have thus given them an opportunity to attack the contiguous portions of the rock, removing the more soluble constituents and replacing them with metallic minerals. These deposits show their greatest development in the vicinity of eruptive rocks, from which doubtless their valuable contents are derived. On the Portland Boy, at the head of Bedrock gulch, near an immense dike of monzonite, which forms the divide between the Mancos and the La Plata, one of these deposits is 10 ft. thick; and on the Doyle properties at the head of the East Mancos river, no fewer than five of these ore-beds are exposed on the side of Treasure ridge, which apparently is traversed from end to end by a body of monzonite and contains numerous bodies of rhyolite and diorite and is cut by a number of fissures, several of which are gold-bearing veins of economic importance. None of these ore-beds have been developed to any great depth, though short adits have been driven at frequent intervals on them all for a distance of a mile or more along the outcrop, giving the hill very much the appearance of Gibraltar from a distance.



The La Plata Mining District, Colorado.

The principal one of these deposits, which is the lowest one exposed, has one adit nearly 500 ft. and has produced in the neighborhood of $50,000, with considerable rich ore still in sight in the workings, although the mine has been closed down practically ever since it was acquired by Mr. James Doyle, several years ago. The property is equipped with a 10-stamp mill, electric plant, Durkee drills, electric pumps, etc., and a lot of fine buildings, testifying to the vagaries of an impractical manager who preferred the adornment of the surface to the expenditure of his funds underground. Most of this ore is low-grade but there are bodies of rich ore and under judicious management these properties should do well, for they were profitably operated by the original owners, who treated the ore in a little mill consisting of two Tremain batteries, plates, and a double-deck Wilfley. The concentrator was evidently more ornamental than useful, for the entire saving was made on the plates and no concentrate was shipped, although the tailing impounded will assay over $20 per ton. The operators were not practical mill-men and the ground beneath and below the mill is heavily charged with quicksilver and amalgam; the fact that their last run, of 21 hours' duration, produced a retort worth $2900 illustrates the richness of some of this ore.

In this portion of the district the important metal is gold; practically no base metals occur, except iron and some copper. Over all other parts of the La Plata mountains the gold and the silver are equally

important; and tellurium, bismuth, arsenic, antimony, mercury, lead, zinc, and other metallic elements are associated in the ores.

The district has suffered from the financial depression, but still there is work going on all over the southern and eastern slopes of the mountains. On the East Mancos river are numerous promising prospects, in addition to the mines already mentioned, although little but the annual assessment work is now being done. The Old Kentucky, which has been idle for two years, is about to resume operations, and bids are asked for raising 80 ft. and sinking 200 ft., it being the intention to operate in the future by shaft, the best ore so far developed being below the adit-level. The Gold Dollar is working a small force on a good-sized vein having a pay-streak 16 in. wide, from which a shipment to the Durango smelter a few days ago returned $41.50 per ton.

On the La Plata river several mines are in active operation and making a remarkable showing. At the mouth of the canyon is the May Day, previously mentioned, which has produced close to $500,000 net and is shipping 8 to 12 cars per month with a force of about a dozen men underground. It is equipped with steam-power plant, air-drills, a Crane ore-washer, electric lights, and the buildings are excellent in design and convenience. A wire-rope tramway connects the ore-house with the shaft half-way up the mountain, but this has been put out of commission since the completion of the adit near the base of the hill, through which all operations are now conducted. This is the loading-place for all mines along the river, the Rio Grande Southern railroad having built a switch two years ago connecting this mine with the main line, three miles away.

The ore of the May Day, like most of the rich ore of the district, is a telluride, chiefly petzite and sylvanite. Adjoining this property on the north, the Valley View is working about 15 men on development, making monthly shipments of high-grade ore similar to that of the May Day. It is equipped with power-drills and a Crane washer, and has a good showing. It is said to have produced about $80,000. Across the gulch is the Movovaratz, one of the early locations, which was idle thirty years and revived last year. Here a bed of black limestone close to a body of diorite-porphyry has been impregnated with galena carrying 20 to 30 oz. silver per ton, and some good ore is being produced, of which a shipment will be made soon.

Up the river a mile from the May Day, the Little La Plata is producing some excellent ore, and will soon enter the shipping list, though the workings are hardly away from the grass-roots; and across from the Comstock the Lucky Four is driving a cross-cut to open up several veins that have produced pay-ore high up on the mountain. They are using a Temple drill operated by a gasoline-engine.

The Bonnie Girl, about a mile above La Plata City, is also undergoing development. The sandstone at this place has been impregnated with auriferous iron-pyrite over a large area and to a depth of two or three hundred feet. Stringers carrying good ore are of frequent occurrence, and near the surface the gold is free; but the entire mass is rather low-grade and has not yet proved profitable. On the river below the mine a large electric plant run by water-power, a 50-stamp mill, and other expensive equipment, including a wire-rope tramway to the mine, were installed three or four years ago; but the mill has been operated only at intervals during the summer months, and the plant has usually been damaged considerably by snow during the winter, so that most of the summer seasons have been spent in making repairs.

In Basin gulch, near the head of the La Plata, the Tomahawk company has been steadily developing promising ground and taking out some rich ore in the course of the work. They have a small steam-electric plant on the river nearly a mile below the mine, and use Temple drills for the level work, coal-augers operated by hand giving most satisfactory results in all vertical work. The workings consist of 1700 ft. of cross-cut and nearly 2000 ft. of drift on three veins along the contact of a diorite dike and red sandstone, the vertical depth being about 700 ft. The pay-streaks vary in width from an inch to two feet or more, and assay well, in places many thousands of dollars per ton, specimen rock being as rich in sylvanite as any seen in the Cripple Creek district. This company has recently taken a bond and lease on the Small Hopes, another old property near-by in Williams gulch, and has commenced development. The Small Hopes was operated 12 years ago and produced a couple of carloads of rich ore from a shaft several hundred feet above the adit now being driven.

West of the Tomahawk is the White Diamond group, on which are a number of veins from 6 to 25 ft. wide, developed by a 700-ft. cross-cut, a 150-ft. cross-cut, several shafts and raises. Assays are said to range from $53 to $10,000 per ton, but probably no systematic sampling has ever been done. About Oro Fino, at the head of Junction creek, much activity is being manifested. Several old properties are resuming work, and two or three good strikes have been made lately. The Neglected, which has been closed down because of litigation for the last four years, is about to resume under new management, and a new plant of machinery will be installed. This property was opened about six years ago by Durango prospectors and made an enviable record, producing, it is said, about $600,000 during two years of operation. The Portland, Fassbinder, Gold King, and Swamp Angel are all under active development and have promising showings. The Portland has a 50-ft. shaft and about 200 ft. of drifts, from which picked samples run several thousand dollars per ton. On the eastern base of Silver Mtn. a five-foot vein has recently been opened which carries about a foot of ore ranging in value from $50 to $100 per ton, practically all silver, with a fraction of an ounce of gold.

A great deal of prospecting has been going on all over the district, with encouraging results; and there are many other old properties, such as the Durango Girl, Democrat, Eureka-Bulldozer, Mountain Lily, Century, Belle Hamilton, Ashland, and others, which produced rich ore many years ago and might

now be re-opened with profit, with the improved facilities for mining, shipping, and treatment. The orebodies as a rule are comparatively small, but the ores are exceptionally rich; and the success of the May Day and Tomahawk at depths of 700 to 800 ft., the deepest workings in the district, proves that the gold and silver persist to a considerable depth, contrary to former opinions of engineers regarding the veins in these mountains.

A description of this district would be incomplete without mention of the promising copper prospects that occur at the head of Bedrock creek and along the divide between this stream and the East Mancos river. Here an area of several square miles is principally monzonite porphyry carrying an appreciable quantity of copper. All this rock, as far as sampled, carries from a trace to 5% copper, while there are many narrow veins carrying copper glance, azurite, malachite, and chalcopyrite; and in the seams and cracks of the porphyry leaves of native copper are found. The water issuing from the porphyry is heavily charged with copper, so that prospectors in the neighborhood of Bedrock gulch have amused themselves during the past season by precipitating a quantity of metal on tin cans and pieces of scrap-iron placed in the stream.

The only development on these prospects consists of shallow surface workings; but the showing certainly justifies exploration and indicates that these great low-grade bodies may become commercially valuable by operation on such a scale as the mines at Bingham, for instance, which they closely resemble in character.

A cement paste for protecting steel from gaseous fumes has been used by the Pennsylvania railroad at Columbus, Ohio, with signal success. The coating is a cement paste mixed in the proportion of 12 lb. pure red lead, 32 lb. portland cement, 4 lb. linseed oil, and 2 lb. dryer. This mixture should make a paste like putty, but if too soft, cement and red lead are to be added, and if too heavy, oil and dryer are to be added. The method of application is as follows: 1. The iron or steel surface to be coated should be as clean of rust and foreign matter as it can be made, using either sand-blast, steel brush, chisel, or sand-paper for this purpose, according to the amount and hardness of the foreign matter to be removed. 2. Apply one heavy coat of red lead and allow it to set. 3. Apply one heavy coat of Japan dryer. 4. Apply paste on dryer while latter is green; do not allow Japan dryer to become dry before applying paste. The paste should be put on about one-eighth inch thick, rubbed with trowel and pressed around rivet heads and angle flanges by hand. 5. Cover all with one coat of red lead. This last coat adds a great deal to the life of the coating, as it retards the hardening effect of the atmosphere on the paste. The life of the coating is said to be six years, and the cost for labor and material, including the cleaning of the metal, eight cents per square foot.

Oyster-shells are burned into lime at Baltimore. The shells before burning contain about 52% lime and 40% carbon dioxide.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

C. H. D., Yreka, California: Barite.

H. L. J., Alleghany, California: Talc schist.

D. P., Goldfield, Nevada: Wad, the earthy oxide of manganese.

D. C. McD., Ely, Nevada: No. 1, hematite (black) in altered granitic rock; No. 2, earthy limestone.

C. C. W., Cannonville, Utah: Fragmental rock covered with thin film of iron oxide. The colors are those observed in tempering steel.

H. H. B., Eureka, California: No. 1, fine-grained biotite-hornblende granite, may be dioritic in larger masses; No. 2, diorite; No. 3, hornblende andesite.

J. M., Dillon, Montana: Black sand, containing large proportion of magnetite; also large amount of basic silicates, some spinel and some metallic sulphides; no platinum noted; any assayer should be able to smelt the sand.

A. H. C., Pyeng Yang, Korea: No. 1, basalt: No. 2, fine-grained crystalline schist; No. 3, spotted schist derived probably from a basic igneous rock; No. 4, crystalline schist, seems to be a modification of No. 2; No. 5, wall-rock of vein or fissure altered by pressure and mineral solutions, and containing considerable chalcopyrite; No. 6, platy amphibole filled with calcite.

J. A. R., Sylvanite, New Mexico: The white to yellowish white mineral with brilliant metallic lustre is tetradymite, since it has a very good cleavage in one direction and yields excellent tests for tellurium and bismuth without giving any suggestion of sulphur or selenium. On each of several trials it was completely volatile before the blow-pipe, from which it follows that gold is not combined with it. It does contain gold mechanically included in lumps, which are plainly visible and sharply limited. In one place gold was noticed as occurring in a thin layer, partly separating the tetradymite from a dull gray metallic substance which apparently enclosed both the gold and the tetradymite. Owing to the scanty amount of the substance, its nature could not be determined.

J. A. P., Fairview, Nevada: No. 14, altered andesite; No. 15, rhyolite or andesite, much altered and containing considerable sulphide; No. 16, andesite impregnated with sulphides; No. 17, andesite; No. 18, rhyolite, silicified and containing sulphides; No. 19, surface rock, much altered and silicified, probably rhyolite, but too far decomposed for identification; No. 20, rhyolite stained with iron oxide; No. 21, andesitic tuff; No. 22, highly altered surface rock, probably rhyolite, stained green; No. 23, rhyolite; No. 24, bleached and altered rhyolite; No. 25, almost completely silicified rock, rhyolite or andesite; No. 26, andesite altered by hot mineral solutions; No. 27, rhyolite with sulphides; No. 28, andesite; No. 29, iron-stained and partly decompased rock from surface, probably rhyolitic.

SINKING A REINFORCED-CONCRETE SHAFT.

By Louis L. Brown.

*On the flats across the Susquehanna river from Wilkesbarre, Pa., the Delaware, Lackawanna & Western railroad is now sinking a shaft for its Woodward colliery, in the first 80 ft. of which a reinforced-concrete caisson was used to penetrate the extremely wet and porous overlying strata. From borings it was determined that difficulty would be found in sinking through these layers of sand, gravel, and quicksand above the rock strata, which lie about 79 ft. below the surface, especially as the water in the soil maintains about the same level as the river, and the latter varies constantly, at times flooding the whole country. The quantity of water to be overcome in sinking would have been so great, on account of the proximity of the river, that some special method had to be devised for making the shaft water-tight, in order that the subsequent sinking

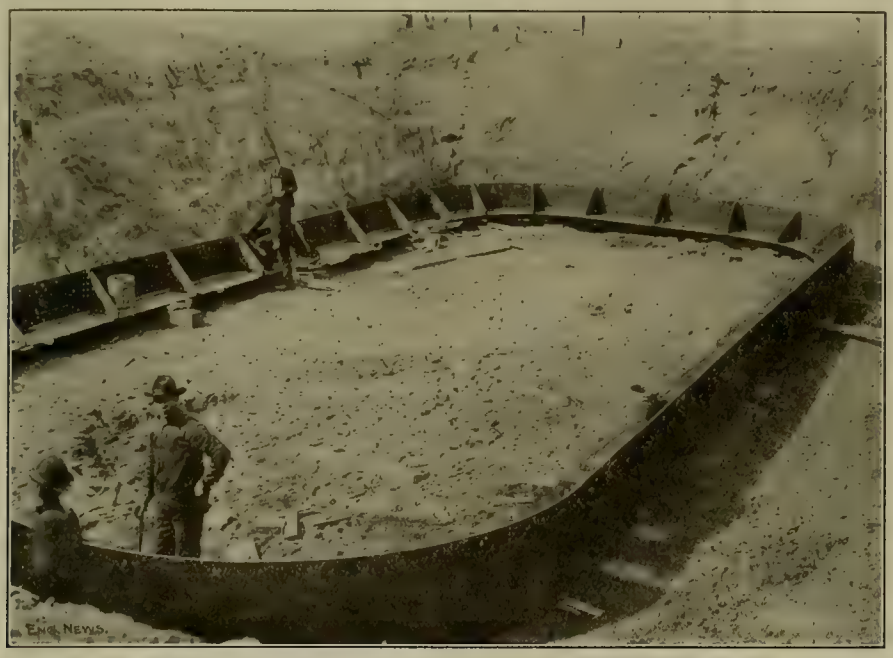


Fig. 1. The Steel Cutting-Edge of the Concrete Shaft.

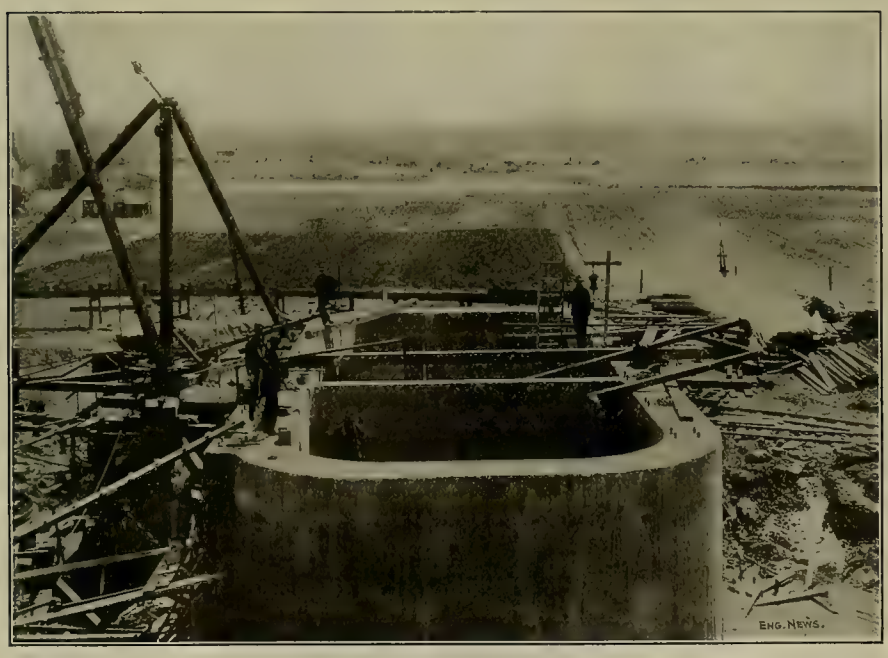


Fig. 4. View of Finished Shaft.
(Showing nature of country in which it was built. Susquehanna river and Wilkes-Barre in distance.)

*Abstracted from *Engineering News* of September 24, 1908, by permission of the publishers.

through the rock to the coal-bearing veins could be completed. After considering these features, the railway engineers designed and constructed a reinforced-concrete shaft-wall, which was built above ground and sunk into place by excavating beneath.

The contractors started work in September, 1907. The first operation was to excavate a pit 15 ft. deep, to just above the ground-water. The bulk of this earth was taken out by scrapers, the steep sloping sides being finished with two derricks. The bottom of the pit, roughly 65 by 33 ft., was then leveled and the steel cutting-edge (Fig. 1), 59 ft. 6 in. by 28 ft., was set up and assembled. This cutting-edge or shoe was made of ¾-in. plate, well reinforced with riveted angles. The outside vertical plate of this shoe was 32 in. high, and the shelf that carried the green concrete, and afterward protected it during the sinking, was 24 in. wide and 8 in. above the toe of the vertical plate.

During the time of excavating a gang of carpenters had been building three complete sets of forms. After the cutting edge had been carefully leveled the first forms were set up and firmly braced, tie-rods as well as ordinary pushing-braces being used. The closely spaced 1 by 1¼-in. reinforcing rods were then placed and the concrete deposited. The outside form of this first section was built plumb, while the inside was battered back so that the concrete wall sloped up to a 7-ft. thickness on the sides and a 5-ft. on the ends. The complete design is shown in Fig. 2. Other vertical forms were then set up and concreted until a total height of 20 ft. was reached, when the bottom forms were removed and the caisson carefully leveled and prepared for sinking. Only three sections of forms were used to complete the job. The concrete was machine mixed and deposited in the forms by means of the two derricks and cyclopean buckets. The concrete was mixed in the proportions of 1:2:4. The total reinforcement amounted to 140 tons. The shaft being designed with three compartments, for air, pump, and hoist, the two partition walls were carried up with the other work. These helped to strengthen the outer walls against the lateral earth pressure as the caisson was being sunk.

While it had been considered possible to sink the caisson to rock without the use of compressed air, yet, on account of the great volume of water in the soil, it was by no means certain that the open method would be successful. For this reason the contractors designed a heavy timber deck, and all arrangements were made so that the change from the open method to that of the pneumatic process could be effected without loss of time. The possible use of an air-deck necessitated leaving a recess in all the shaft-walls. This recess was 8 ft. above the cutting edge, and was 9 in. deep and 39 in. high. Fortunately it was not necessary to resort to the pneumatic process, although the point where it would be imperative was practically reached.

Before starting the sinking, two single-acting pumps, of a combined capacity of 1400 gal. per min., were placed on timbers 8 ft. above the cutting edge, and sinking operations started on November 7, 1907. The sinking proceeded both day and night, in two 10-hr. shifts. Each gang consisted of a foreman and 16 men. The material as it was excavated was shoveled into 1½ cu. yd. buckets, which were hoisted by two stiff-leg derricks. These derricks had 45-ft. booms, and as the buckets were hoisted they were automatically dumped into 1½-yd. cars, which were run in on four sidings close to the caisson. These cars were then pulled by mules to an adjoining field, where they were dumped and the empties run back.

In sinking, quicksand was first encountered, then gravel. As the open excavation had been carried down to within one foot of the ground-water line, the pumps had to be started with the very first of the sinking, and by the time the gravel was reached were handling 1200 gal. of water per minute. Under the gravel was found a bed of stiff clay, which reached in some places to the rock, while in others it was underlaid with about 18 in. of peaty gravel. When passing through the clay no water was in evidence, the clay closing around the caisson and preventing the water from following or entering under the cutting edge.

The sinking of such a large mass of comparatively green concrete was, of course, attended with difficulty, requiring the constant attention of experienced men. Inasmuch as one of the shaft-compartments is to be fitted with guides for two elevator cages, the question of plumbness alone was a big factor. Levels were taken at frequent intervals, and the excavation made in such a way that the walls as they sank maintained a practical plumbness. As can be imagined, in a length of 60 ft. soils of different consistences were found at different points along the cutting edge. The caisson at such times required careful handling. An average excavation of from 90 to 100 cu. yd. per 10-hr. shift was considered good progress.

While the work of cleaning off the rock was in progress, the river rose rapidly and flooded the flats. The increased head resulted in the water being forced down between the clay and the sides of the caisson. This water came in under the cutting edge and rose so quickly that the pumps could not handle it; they were soon drowned and the shaft filled. Extra pumps were immediately ordered and the task of lowering the water was started. The additional pumps were of the piston-packed type, and worked satisfactorily until the water was lowered to about 10 ft. above the cutting edge. Then, owing to the fact that the water carried large quantities of gravel, a great deal of trouble was experienced. The sand not only wore out the packing, but also the water-cylinders to such an extent that the piston slippage was so great that even the largest of the pumps proved inadequate. On this account sufficient extra pumps had to be installed so that the shutting down of any one would not cripple the job. The addition of a motor-driven centrifugal pump of 1000 gal. capacity also helped, and the water was then lowered to below the cutting edge. When the excavation reached the rock it was found that it would be necessary to construct a temporary seal between the rock and the shoe for the whole perimeter. This was done by means of 12 by 12 in. yellow pine blocks and white pine wedges. As the work progressed

6-in. pipe 'bleeders' were left in, to handle some of the water and thus relieve the pressure at the points at which the men were working to put in new blocks.

Owing to the constant fluctuation in the height of water in the bottom, due to numerous troubles with the pumps, and also the difficulty of keeping the sand and gravel back during the work, the final sealing was a slow and tedious operation. After the last blocking had been wedged in place the bleeders were closed and the inflow of water, with the exception of some minute squirting streams, checked. These streams were speedily calked with white pine wedges, resulting in a practically dry bottom.

The next task was to take out the rock to a depth of 20 ft. and build up an underpinning wall to carry the weight of the caisson and make the permanent seal to keep out all water. To avoid the possibility of jarring loose any of the temporary sealing blocks or breaking back into the slatey rock, this excavation was started by channeling for a depth of 5 ft. all around the shaft about 1 ft. inside of the blocking. The rock was then taken out in the ordinary manner with two shaft-bars and four rock-drills. To prevent the jarring of this blocking the rock was taken out in 5-ft. benches only. This made the work slow, but it was deemed advisable, and so proved, for, notwithstanding every care, certain leakages occurred which made the rock excavation slow, requiring shifting of pumps, taking off and putting back suction pipes, etc. This rock would break back a considerable distance from the line of holes. On this account, upon arriving at the elevation at which the underpinning wall was to start, the rock had to be again channeled for a depth of 5 ft. all round

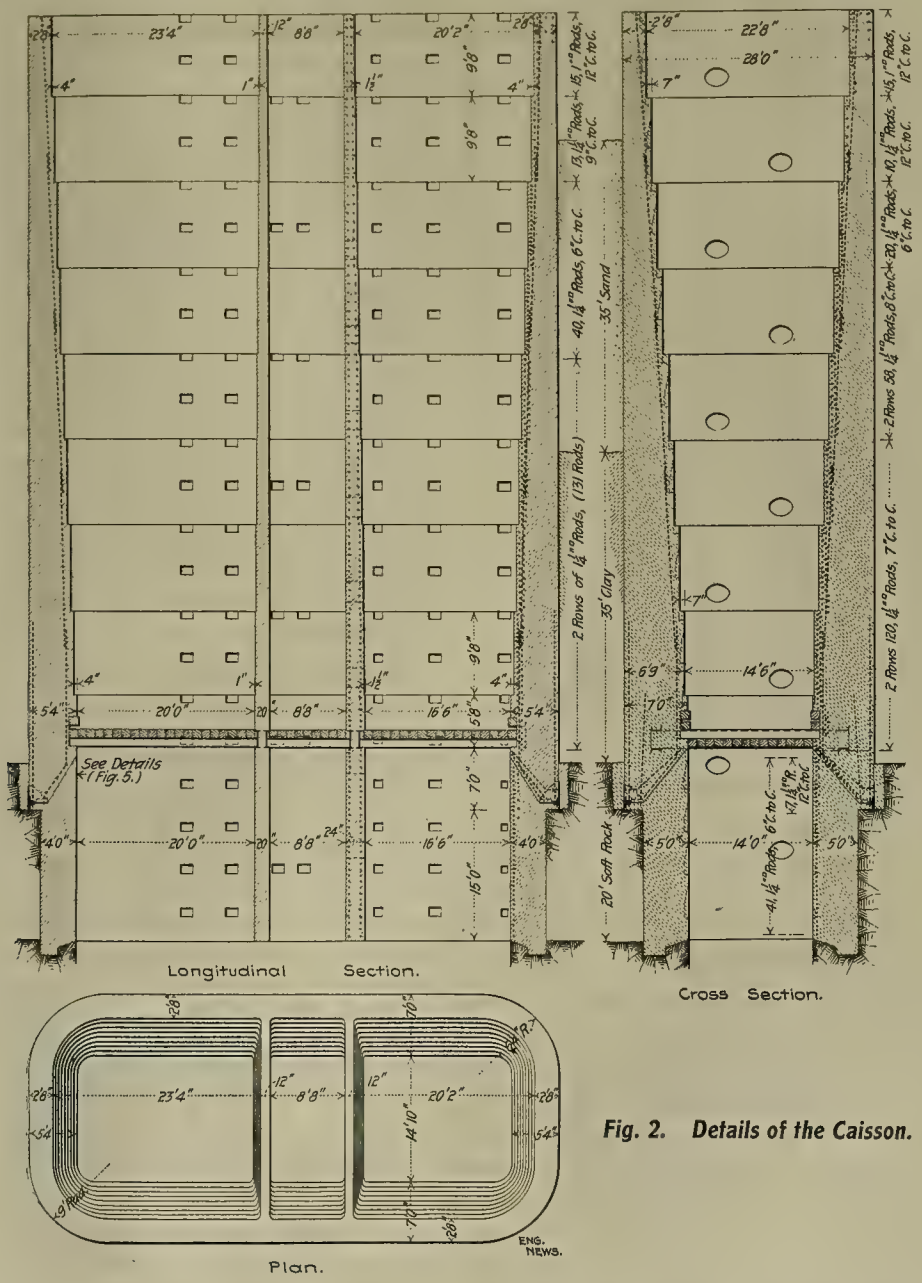


Fig. 2. Details of the Caisson.

the inside line of the wall. The rock inside this line was then taken out and formed a sump, which enabled the concrete wall to be started on a dry bench. This also precluded any chance of damaging the concrete by the heavy firing necessary in proceeding with the excavation. While this excavation had been progressing, grout had been forced back of the blocking under the shoe by means of a pump operating at an 80-lb. pressure. This gradually cut down the leakage until that remaining about equaled the water which would flow through a 2-in. pipe.

Before starting the concrete underpinning wall, the rock footing was carefully cleaned off and a recess cut in it to form a stout toe for this wall. Various seams in the rock emitted water. This was handled during the building of the wall by fitting a

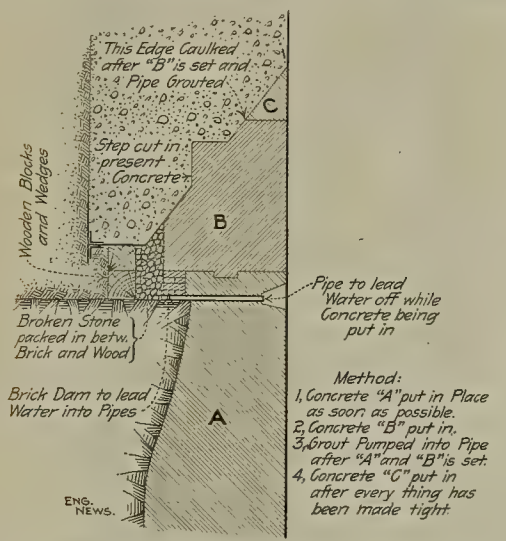

This Edge Caulked after "B" is set and Pipe Grouted
C
Step cut in present Concrete
Wooden Blocks and Wedges
B
Pipe to lead Water off while Concrete being put in
Broken Stone packed in betw. Brick and Wood
Brick Dam to lead Water into Pipes
A
Method:
1, Concrete "A" put in Place as soon as possible.
2, Concrete "B" put in.
3, Grout Pumped into Pipe after "A" and "B" is set.
4, Concrete "C" put in after every thing has been made tight.
ENG. NEWS.

Fig. 3. Joint Between Caisson and Rock Bottom.

small wooden trough around the wall and leading the water beyond the face of the wall through pipe bleeders. Grout pipes were also inserted in the tops of these troughs, led beyond the face of the wall, and grouted after the concrete had set sufficiently to resist the resultant pressure. To help bond the underpinning wall to the caisson proper, and help carry its weight, the inclined face of the concrete above the shoe was not only roughened, but also had a 1-ft. step cut in it. Fig. 3 shows the method of making the permanent seal between the shaft-wall and the rock. To prevent the possibility of flooding by any high stages of the water in the river the shaft-wall was carried up to 15 ft. above the general ground level.

The merits of the Edison long-kiln system for burning cement may be considered as beyond dispute since the North American Portland Cement Co. has acquired the patents from Mr. Edison. This means that the Edison system will be adopted as standard by the cement 'trust.'

Mineral waters from American sources were sold in the United States in 1907 to the extent of 52,060,520 gal., valued at the point of production at $7,331,503, or approximately 14c. per gallon.

IRON ORES IN UTAH.

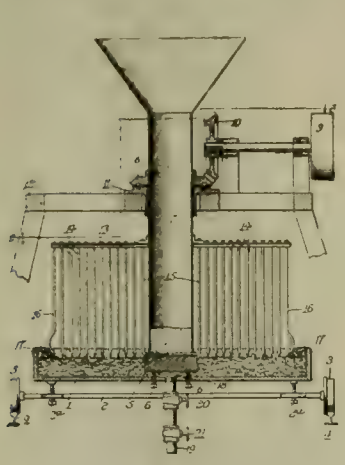
At present less than 2% of the iron ore mined annually comes from west of the Mississippi, but the Western deposits are now coming into demand. One such deposit, in Iron county, southern Utah, in the Iron Springs district, has been explored by about 1600 pits, but as the deepest pit was carried down only 130 ft., the vertical depth of the ores is not known. Their total tonnage, as far as can be measured, is 40,000,000 tons. The nearest railroad station is 22 miles distant. The ores occur in disconnected masses, within an area 1½ by 20 miles in extent, most of them at or near the contact of limestone and andesite, the latter existing as a laccolith or sill. Iron ores and other minerals were deposited as fissure veins in the andesite and as replacement bodies and fissure veins in the overlying limestone. Finally erosion exposed the laccoliths and the ores. The ores in the andesite may extend down to very considerable depths. The only one of the laccoliths the thickness of which can even be estimated at present probably does not extend farther down than 2500 ft. The uniform association of ore with laccoliths in this and other Western iron districts outlines the first rule for the prospector searching for such ores—to find the laccoliths and determine their boundaries. The contact with the sedimentary rocks should be carefully explored. In places the ores stand out in great black ridges, but elsewhere they are concealed beneath the debris that has slid down the mountain sides.

Aluminum in warm and boiling hot solutions containing hydrochloric and sulphuric acids evolves hydrogen with great rapidity, and reduces ferric salts to the ferrous condition, and its use for that purpose has been suggested by W. H. Seamon in the *Western Chemist & Metallurgist.* It is more than three times as active as zinc. Fifty-five parts of aluminum produce six parts of hydrogen, while 65 parts by weight of zinc yield but two parts of hydrogen. Theoretically, one part of aluminum should reduce six parts of iron, and the consumption of aluminum is very small, less than one-tenth of a grain for ores carrying a high percentage of ferric iron. The reduction from sulphuric solutions is perfect, and more rapid than with zinc. By boiling for four or five minutes most ores will be completely reduced; if greater rapidity than this is desired, the addition of a few c.c. of hydrochloric acid will make it almost instantaneous. As a substitute for stannous chloride in the bichromate method its use will be found most satisfactory. In hot hydrochloric solutions the reducing action is as rapid as stannous chloride, and it is impossible to use an excess. The aluminum should be left in the solution while cooling down to the temperature of the room. When ready to titrate, pour the solution into a vessel and complete the titration, rinsing out the vessel in which the reduction was effected with tap water and completing the titration. The aluminum sheet now furnished for assayer's use contains but 0.1% iron, corresponding to an error of about 0.02%, or less, when half a gram of pulp is employed.

MINING AND METALLURGICAL PATENTS.

Specially reported for the MINING AND SCIENTIFIC PRESS.

AMALGAMATOR.—No. 900,965. Fred Stringham, Monitou, Colorado.



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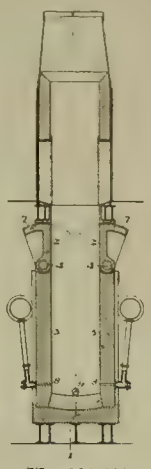


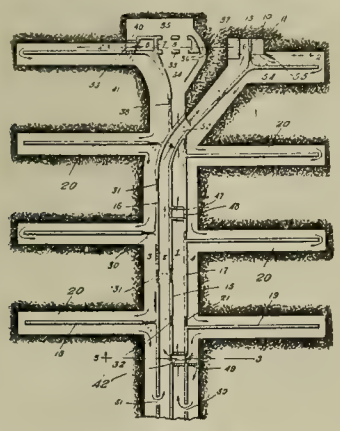
No. 900,466

In an amalgamator, the combination of a pan adapted to contain an open bed of mercury, a block rising from the central portion of the pan and projecting above the surface of the mercury, a feed tube terminating slightly above the block for feeding the material, and mechanical means acting in the space between the tube and block for removing the material therefrom and delivering it laterally onto the open surface of the bed of mercury.

METHOD OF SMELTING ORES.—No. 900,466. Ralph Baggaley, Pittsburg, Pennsylvania.

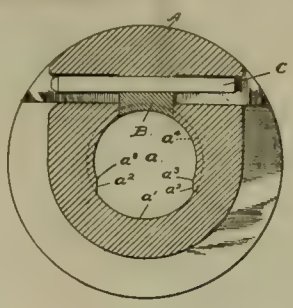
The method of treating ores, which consists in producing a molten bath high in fuel values, dissolving in the bath ores having constituents for releasing and fluxing the iron and mineral values contained in the molten bath, the process when started being carried out without the use of carbonaceous fuel and by the heat produced by the oxidation of the fuel values of the ore and bath, and during such process varying the area of the escape opening of the vessel in which the process is carried out conformably to the heat requirements of the bath, whereby the heat produced within the vessel may be held therein to a controllable maximum extent; substantially as described.

MEANS FOR PREVENTING MINE DISASTERS.—No. 903,492. Martin T. McDonough, Sun, West Virginia.



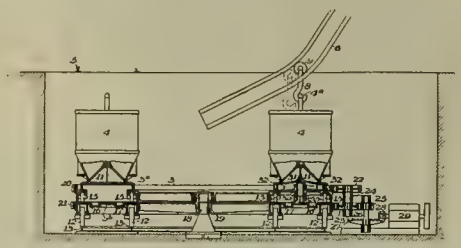
A mine having a main hauling way, auxiliary hauling ways and working passages, a manway or safety passage substantially parallel and co-extensive in length with the main hauling way, and means for creating a current of air through the auxiliary hauling ways and working passages, said current finding its outlet through the manway and the main hauling way.

STAMP-MILL TAPPET.—No. 901,417. Martin P. Boss, San Francisco, California.



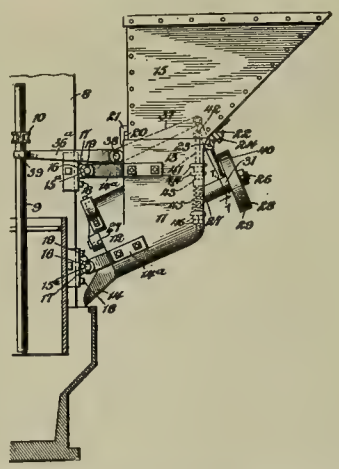
A stamp mill tappet having a stem bore, and a channel at its side, the end walls of the channel being straight and joining the wall of the bore at points of the separation approximately but slightly less than the length of the diameter of the bore, whereby the stem may be wedged between said end walls, the wedging points on the stem being separated approximately but slightly less than the length of the diameter thereof.

CHARGING APPARATUS FOR BLAST-FURNACES.—No. 903,423. Homer D. Williams and William Ahlen, Duquesne, Pennsylvania.



Blast furnace charging apparatus, comprising stock carriers in which the materials are hoisted and charged into the furnace top, and mechanism arranged to distribute the contents and vary the relative location of coarse and fine materials in the successive carriers preparatory to hoisting them to the furnace top; substantially as described.

ORE-FEEDER.—No. 903,491. Alexander McCombie, Grass Valley, California.

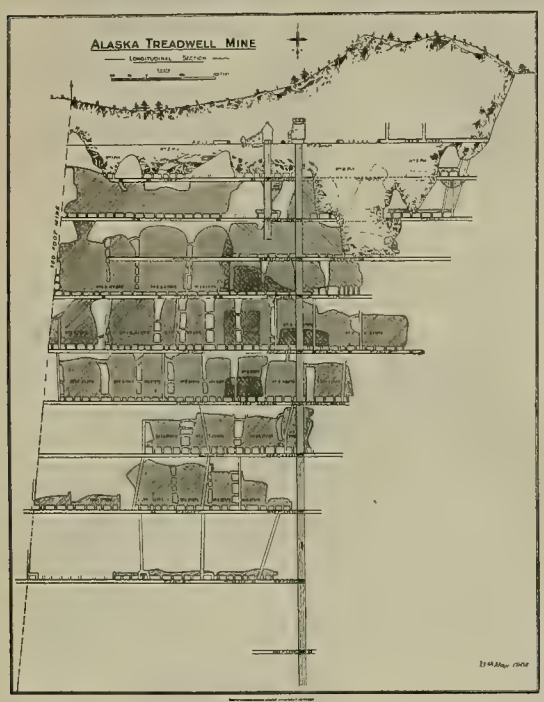


In an ore feeder, the combination with a battery frame, of ears secured thereto, feeding mechanism including a conduit or spout, and angularly disposed sets of arms secured to the conduit or spout, the arms of each set being divergently disposed, said arms and ears being provided, one with sockets the other wth pins, that detachably engage in the sockets.

COMPANY REPORTS.

ALASKA-TREADWELL.

The annual report covers the year ending May 31, 1908. The 540 stamps crushed 743,097 tons of ore, yielding $887,509 as free gold extracted by amalgamation and 12,968 tons of concentrate, giving by smelting at Tacoma an additional $736,636. Thus the yield from concentrate was nearly equal to that from amalgam. The total yield was $1,624,145, as compared to $1,511,671 last year. The yield per ton was $2.18, as compared to $2.15 last year. The total operating costs were $577,493, showing a cost of $1.40 per ton and a profit of 64.5% on the gross production. The deepest level is at 1450 ft. The bulk of the output came from the stopes between 600 ft. and 1050 ft. From the pits or 'glory hole' only 86,318 tons were taken. It is now no longer economical to break ore in these open workings, owing to the depth attained—a maximum of 500 ft. During the year 9764 ft. of development work was accomplished. The ore reserves are estimated at 4,664,743 tons, of which 709,055



lies broken in the stopes. Thus there is enough ore for 6 years, at the present rate of extraction. There are 32 machine-drills in the mine, averaging 35.9 ft. of drilling per 10-hr. shift, and breaking 29.35 tons per machine per shift. The maximum duty was 54.68 ft. drilled and 53.9 tons broken per shift. In the pits the average was 87.8 tons broken per drill at a cost of $3.12 per shift for explosives. The average cost of explosives in the mine was $2.86 and the average cost of supplies, power, and repairs was $3.72 per machine-shift. From 3482 samples taken in the mine the average yield was $2.45 per ton.

The 240-stamp mill lost 17 days 20 hours during the year and crushed 377,271 tons, equal to a duty of 4.51 tons per stamp. The quicksilver used weighed 53,188 oz. Also 756 shoes and 400 dies. The 300-stamp mill lost 144 days 15 hours and crushed 365,826 tons, or 5.5 tons per stamp. Of quicksilver, 60,829 oz. were used; also 921 shoes and 500 dies. This mill is not operated in mid-winter. It was idle during February, March, April, and part of May. The cost of milling was 17.36 cents per ton. During the year crude oil replaced coal as fuel for making steam. The saving made amounted to $50,759; this was done at a total cost for equipment of only $28,679. Oil is now used exclusively in all the steam-power plants of the Company.

The report and the accounts are complete and detailed. This is not only one of the big gold mines of the world and the one exhibiting lowest costs, but it is also one of the best managed in every department. Robert A. Kinzie is superintendent, E. P. Kennedy is assistant superintendent, and F. W. Bradley is consulting engineer.

NEVADA CONSOLIDATED COPPER.

Boston.—The Nevada Consolidated Copper Co. has issued its second annual report. The financial statement as of September 30, 1908, compares with that of June 30, 1907, as follows:

	Sept. 30, 1908.	June 30, 1907.
Assets:		
Property account	$4,481,208	$3,880,242
Investment account	*4,848,500	3,050,000
Trustees' capital stock	3,994,000	1,000,000
Material on hand	120,687	.....
Accounts collectible	12,834	3,250
Ores in process	152,834	.....
Cash and call loans	793,940	710,943
Total	$14,404,039	$8,644,435
Liabilities:		
Capital stock	$8,000,000	$6,500,000
Mortgage bonds	2,994,000	.....
Surplus account	3,122,711	1,961,503
Accounts payable	178,152	139,125
Income account	109,176	43,807
Total	$14,404,039	$8,644,435

*Includes stock of other companies, including Steptoe Valley Smelting & Mining Co., Nevada Northern Ry., and Cumberland & Ely Copper Co.

The Nevada Consolidated issues a statement of condition of the property and work thereon since November 4, 1907.

Pope Yeatman, consulting engineer, recommends that still another unit be added to the concentrator for handling Nevada Consolidated ores. Prospecting on the Eureka section has developed over 5,500,000 tons of ore of an average grade. This increased ore blocked out to fully 20,000,000 tons.

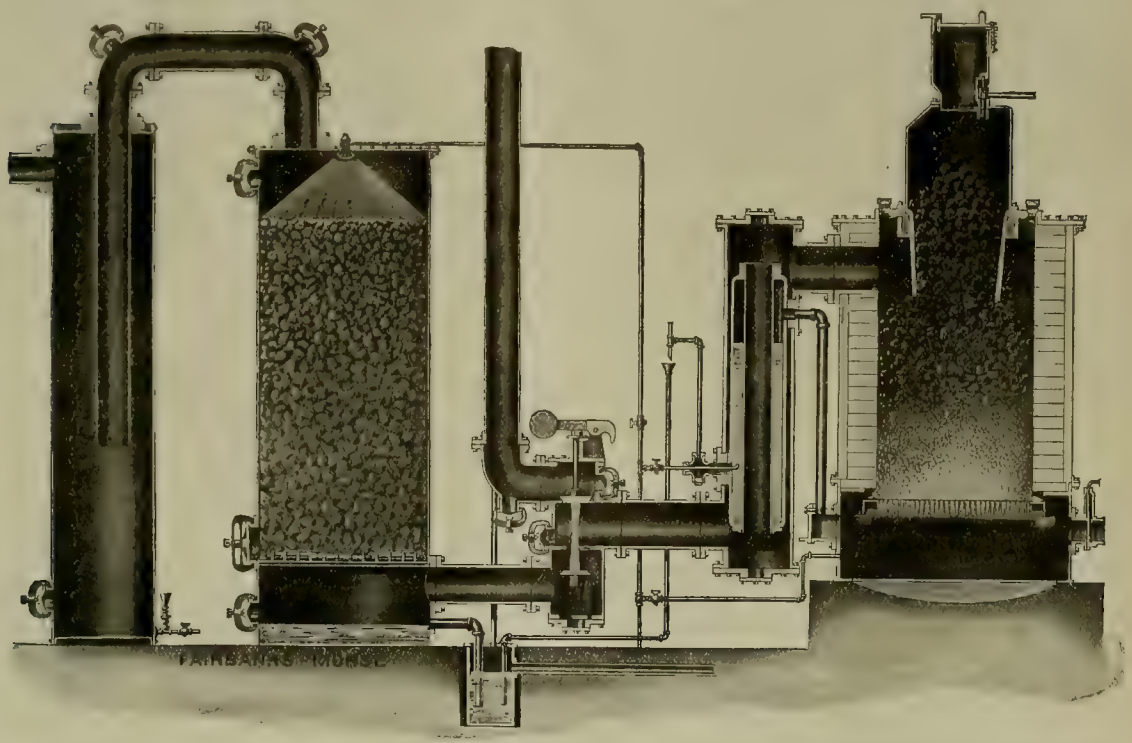
Ore blocked out represents an area small in proportion to the total, and possibilities for a large increase of tonnage are very great, not only through considerable extension of present developed orebodies and partly prospected areas, but also in large areas not yet touched, which give similar indications of promise to those shown in the developed area. Up to November 1, 185,277 tons sulphide ore have been mined. Total yardage up to Nov. 1 for stripping is 427,244. The sixth section of the concentrator will be placed in commission in December. The capacity of the plant has been proved equal to, or greater than, originally estimated.

Considerable work has been done on water rights during the past year, and a pipe-line has been completed and is in operation, furnishing ample water for present smelting operations, boiler purposes, and for concentration, up to date, even without re-pumping of tailing-water, and, in addition, there is ample for a plant many times the size of the one in operation.

James Phillips, Jr., the president, says it is confidently expected that construction of the additional unit, the fifth of the series, will raise annual production of blister copper to approximately 70,000,000 lb. From data at hand, it may be accepted with confidence that in January 1909 monthly production will be equivalent to an annual production of at least 35,000,000 lb., and that by April next, when additions to the concentrating and smelting plant under way are completed, increased facilities will result in raising annual output to 50,000,000 or 55,000,000 lb. Should Mr. Yeatman's recommendation that still another unit be added meet with favorable consideration reasonably to be expected of the incoming board, it is well within probability that by September next this Company will take its place as one of the six largest copper-producing companies of the world.

Suction Gas-Producer Plants.

Producer gas has been rapidly replacing steam as a source of power for large plants, and it is even invading the field in competition with steam in small units. At a mine in the State of San Luis Potosi, Mexico, a 30-hp. gas-producer supplying gas to a hoisting engine, has been in service for over a year, using charcoal as fuel. This plant shows a consumption of only 1 lb. charcoal per horse power hour, and the total costs for power amount to ₱3 per diem of 10 hours. The apparatus used is the suction gas producer made by Fairbanks, Morse & Co., of Chicago. This is illustrated in the accompanying cut. The fuel is introduced to the producer through a hopper at the top. This has a double closure, so that fuel can be admitted without at the same time admitting air. In the process of partial combustion which takes place, producer gas is generated, that is, the fuel is burned to carbon monoxide (CO) with the



insufficient supply of oxygen. The hot gas passes through a vaporizer, in which a small amount of steam is formed, which, with a limited amount of air, passes under the grate of the producer. In the smaller sizes, the vaporizer is at the top of the producer, where it uses the waste heat from the escaping gas, and at the same time the water keeps the top from getting too hot. In the larger sizes the vaporizer is separate and connected to the producer by piping. From the vaporizer the hot gas flows through the scrubber, which is a cylindrical tank filled with coke, over which a spray of water is constantly sprinkled. The large contact-surface presented by the coke effectually cleanses the gas of dust and impurities carried over from the producer, and also serves to cool the gas, which is essential in order to prepare it for use in the engine.

With certain fuels, especially when much tar is formed, it is also necessary to add a sawdust purifier, in order to abstract the last traces of tar from the gas. While not absolutely essential, it is always advisable to use a gas-tank between the scrubber and the engine, in which a certain amount of gas is stored.

The principal attention required by the producer is that of poking the fire every few hours when using coal, in order to break up and remove clinkers which would otherwise interfere with making sufficient gas. Poke-holes are provided so that every part of the fire can be reached conveniently. Anthracite in 'buckwheat' or 'pea' size, lignite, coke, and charcoal are the fuels commonly used. The lignite producer offers a cheap and reliable power in districts where this fuel is available. There are enormous deposits of lignite in Texas, Arkansas, Louisiana, North Dakota, Montana, Wyoming, Colorado, and other Western States. This can usually be had at from $1 to $3 per ton. At Smithville, Texas, where a 150-hp. lignite producer plant is installed, the cost is $1.70 per ton.

The Fairbanks-Morse multi-cylinder vertical engine is a mechanism of extraordinary efficiency. The features meriting special notice are the following: The present system of ignition is a great improvement. The make-and-break igniter is so constructed that it can be adjusted to spark as early or as late as desired, when the engine is running or at rest, by means of a convenient hand lever. A single lever controls the time of ignition for all cylinders. This is a feature of much importance, especially with producer gas, as it permits timing the ignition to give the greatest possible power and economy with any particular grade of gas and when the engine is running. In addition, there is an independent adjustment for each igniter which is operated by drop cam. The igniters can be removed, inspected, and cleaned without interfering with other working parts, and they are placed most conveniently. As the successful operation of a gas-engine depends largely upon the igniter, the value of these features cannot be emphasized too strongly. Both valves are operated from a single cam-shaft inside the crank-case. This minimizes the amount of noise. The simple fly-ball governor operates a balanced disk-valve so constructed that there is no frictional contact to become fouled by impurities in the gas. This is especially important with engines operating on producer gas. Lubrication is effected by a single elevated oil reservoir, provided with separate brass pipe with individual sight feed for each bearing. The drip from the different bearings collects in the base of the engine, which is drained by means of a small pump. Each engine is fitted with a hand-operated speed-regulator, by means of which the speed can be reduced when engine is running. One cylinder of each engine is fitted with automatic compressed-air starting gear. This can be thrown into or out of action by the movement of a single lever, and the engine is started automatically on compressed air.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

IMPROVEMENTS ON CONTIGUOUS CLAIMS.

Under the United States statutes requiring the making of improvements on each mining claim each year, except where claims are held in common, then the improvements may be made on any one claim only where two or more claims are contiguous and are held in common.

Fredricks *v.* Klauser, (Ore.) 96 Pac. 679, July, '08.

WHAT MAY BE CONSIDERED 'IMPROVEMENT' OF MINING CLAIMS.

The value of the following articles may be considered in estimating the value of improvements on a mining claim: powder, fuse, and candles; the reasonable value of meals furnished, laborers employed in doing development work, who received board in addition to their wages; but not sums paid for transporting such supplies. The value of rails laid on ties in a tunnel, and a reasonable value for the deterioration of tools, may be considered, but not the price paid for such tools. Nor do such items as cutlery, dishes, tinware, groceries, provisions, tobacco, and bed-clothing constitute improvements. The locator is entitled to a credit for the actual work of an employee, though hired as a watchman, where no watchman was required.

Fredricks *v.* Klauser, (Ore.) 96 Pac. 679, July, '08.

MINING LEASE—TRUST FUNDS—SET-OFF.

A lessor in a mining lease having in its hands certain trust funds belonging to the lessee as the proceeds of the sale of ore under the terms of the lease, cannot retain such funds in order that it may off-set against the same damages due for violations of the lease.

Florence-Goldfield Mining Co. *v.* District Court of First Judicial District of Nevada, (Nev.) 97 Pac. 49. (No date.)

MINING LEASE—FUNDS IN LESSOR'S POSSESSION—DEPOSIT.

The lessee under a mining lease was to deliver all ore to the lessor, who should mill the same and pay to the lessee a certain per cent of the smelter returns. In an action by the lessor against the lessee for damages for violating the terms of the lease, the lessor admitted the possession of a sum due the lessee; it was held that the lessor was the trustee for the lessee as to such sum, and was properly directed to pay the same into court.

Florence-Goldfield Mining Co. *v.* District Court of First Judicial District of Nevada, (Nev.) 97 Pac. 49. (No date.)

PLACER CLAIM—EXCESSIVE AREA.

The fact that a placer mining claim as stated exceeded the legal limit had the effect to render the claim void only as to the excess; and where the owner was in possession and working the claim in good faith, he had the right to elect what part he would relinquish as such excess within a reasonable time after he discovered such fact, and he could not be forced to surrender any particular part by the location thereon of an overlapping claim by another before he knew of such excess.

Zimmerman, Funchion, 161 Fed. 859, May, '08.

POSSESSION OF MINING CLAIM—TEMPORARY SUSPENSION OF WORK.

Where locators, after properly locating a mining claim and marking its boundaries, had sunk a shaft resulting in the discovery of mineral, a temporary suspension of work for a few days to procure tools and supplies for continuation did not constitute a break in the actual possession sufficient to entitle another to enter upon and re-locate any portion of the claim, although such entry was made before the locators had actually discovered mineral.

Hanson *v.* Craig, 161 Fed. 861, May, '08.

Publications Received.

Any of the books reviewed or mentioned in these columns are for sale or procurable from the MINING AND SCIENTIFIC PRESS.

COAL. By James Tonge. 8vo., 275 pp. Van Nostrand, New York. 1907. Price $2.

This little book is intended not only for students of various sciences, but "the whole of those people who, though proud of the high commercial position of this country (Great Britain), are unaware as to how greatly this is due to our coal supplies. It discusses especially the origin, position, and extent of the seams, and the economical utilization and application of coal. Its main usefulness will evidently be to the general reader. For student purposes it is too brief and general, and it is not always exact, namely, in the statement, p. 20, "Most geologists agree that 'Cannel' coal is of marine origin." The geological portion is not incisively written, and the paleontologic and paleobotanic text seems over-elaborate for a general reader. The notes on the coalfields outside Great Britain are brief, and there are few references to sources. The statistics of American production are for 1902.

The best chapters are those relating to the use of coal, such interesting tables as that (p. 170) showing the percentages of the main applications of coal, have nothing to show how they are derived and on what authority they rest. Analyses are quoted and compared without any discussion or statement as to how or on what basis they were made. Many evidently represent air-dried coal, but some, pp. 158, 162, etc., seemingly have been calculated to a no-moisture basis. Until the methods of sampling and analysis are at least stated, there is not much benefit in comparisons of coal analyses.

CEMENT LABORATORY MANUAL. By L. A. Waterbury. 12mo., 129 pp., Ill. New York. John Wiley & Sons. 1908. Price $1.

In brief, concise form, instructions are given in this little volume for making all the standard tests of cement required by modern engineering practice. The exact procedure is stated in detail. In this respect the book fills a gap; the *modus operandi* of cement testing is not so minutely described in any other single treatise. The necessary apparatus is also fully described and illustrated. Features which will be appreciated are the reprints in appendices of the standard cement specifications adopted by the committees of the American Society of Civil Engineers, and of the American Society for Testing Materials, respectively; and there is also included the method for analysis of limestones, raw mixtures, and portland cements proposed by the Society for Chemical Industry. The manual has alternate pages blank for annotation.

SEWER CONSTRUCTION. By Henry N. Ogden. 8vo., pp. 335, Ill. New York. 1908. John Wiley & Sons. Price $3.

This volume is, in a nature, a companion piece to the previous volume on 'Sewer Design' by the same author. Both are based upon a series of lectures given in the College of Civil Engineering at Cornell University. This volume is an exceedingly valuable one, and should be of great use to designers, constructors, and inspectors of sewer work. The illustrations are numerous and of the kind that illustrate. An especially valuable feature of the book is the example of a contract and specifications, with a detailed discussion of the various clauses. Numerous examples of particular work and cost data are included.

AMERICAN RED CROSS TEXT BOOK, on First Aid and Relief Columns. By Major Charles Lynch. Pocket size, pp. 244, Ill. Philadelphia. 1908. P. Blakiston's Son & Co. Price $1.

Beginning with the anatomy and physiology, the book succinctly deals with germs or micro-organisms; first aid materials; general directions for rendering first aid; shock; common accidents and injuries; common emergencies; occupation accidents and injuries; injuries and emergencies of indoor and outdoor sports; transportation of wounded and sick; organizations for first aid instruction; first aid contests; closing with a list of references and a complete index.

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EDITORIAL.

DECEMBER disbursements of dividends recorded at New York will exceed $105,000,000, as against $66,054,000 a year ago. The total for the year will be $1,243,134,327. This is evidence of a return of prosperity.

BY THE PAYMENT of the recent $5 dividend the Calumet & Hecla has now paid $107,850,000 to its shareholders. Current production is at the rate of 85,000,000 pounds of copper per year, at a cost of 8½ cents per pound, so that 15-cent copper leaves a handsome margin.

FROM the Secretary of the Transvaal Chamber of Mines we learn that the output of gold in the Transvaal in October was 617,744 fine ounces, worth £2,624,012, or $12,726,460. This constitutes a record, for it is 29,931 ounces more than the previous highest output.

ANNOUNCEMENT is made that the gold medal of the Institution of Mining and Metallurgy has been awarded this year to Mr. James Douglas, "in recognition of his services in the advancement of the educational, technical, and commercial interests of mining and metallurgy, and of his important contributions to technical literature." This is an honor most worthily bestowed, and will give keen pleasure to the many friends of Mr. Douglas. By awarding the medal to such a man, the Institution adds greatly to the value of the medal.

THE PROJECT of mining-law revision as presented to the Mexican Congress by the Minister of Fomento, Sr. Olegario Molina, would restrain foreign corporations from 'denouncing', that is, locating, and from owning mineral lands within a zone 80 kilometres (51.2 miles) wide along international frontiers. Individuals may denounce and acquire title to lands within these zones only through permission granted by the President. Special permits for exclusive right to prospect within zones in which minerals may have been discovered, have not been productive of beneficial results, and they will no longer be issued. By the new law, which is to become effective July 1, 1909, property in mines will be subject to the Civil Code where not in contravention of the specific provisions of the mining law itself.

ORE IN SIGHT usually refers to a mass no more definite than that seen on a foggy morning, when looking up at the under side of the gloom an observer might remark: "Clouds in sight". Indeed, to press the simile further, when the miner asserts that so many tons of ore are 'in sight', there are invariably deep cloudy recesses that he has not pene-

trated, imperiling the accuracy of his arithmetic. Ore in sight is not definitive, because it is susceptible of varying interpretations. As an example of a correct use of the phrase, however, we call attention to the statement in our news from Rossland this week that "there is a good body of ore in sight on the 1650-ft. level." In other words, the indications are good, though indefinite. When speaking of ore in measured quantity, the term 'blocked' is incapable of being twisted into false meanings; even better is 'ore ready for stoping'.

TARIFF REFORM is in the air. The most significant incident of late has been the frank statement by Mr. Andrew Carnegie, in a magazine article, that steel can be made in America "cheaper than anywhere else, notwithstanding the higher wages paid per man." He adds: "Not a ton of steel is produced in the world at as small an outlay for labor as in our own country." Finally: "The day is past when any foreign country can seriously affect our steel manufacturers, tariff or no tariff." It must be confessed that Mr. Carnegie's testimony on this subject is worth more than his opinion on reformed spelling and sundry other questions on which he has been quoted as an authority. He is the most notable of the men who have made a vast fortune by shrewdness, railroad rebates, and the tariff. As the holder of $300,000,000 worth of 5% bonds of the Steel Corporation, he has a property interest in the steel business of America such as gives extraordinary weight to his dictum. Evidently he believes that the removal of the tariff on steel will not hurt the American industry nor, incidentally, his share of it. His frank statement has already disgusted those who look upon him as one of the prime beneficiaries of protection, and the New York *Tribune* upbraids him for "tearing down the walls which enabled him to amass wealth." It is amusing and it is instructive.

GOLD has been obtained for centuries from the Province of Sandia, Peru. We publish an interesting article this week by W. E. Gordon Firebrace describing the placer deposits now being exploited at San Antonio de Poto, in that Province. Being on the west side of the middle Cordillera of the Andes, there has been difficulty to secure a cheap water-supply. This trouble has now been overcome and successful hydraulic mining at Poto seems assured. The great Cordillera is made up of schists with innumerable gold-bearing veins and veinlets, strikingly similar to the California gold-belt, and to the Seward Peninsula in Alaska. The District of Sandia on both sides of this range contains a long succession of auriferous gravel-beds, which in the vicinity of Carabaya have been eroded, leaving extensive gravel ridges several hundred feet in height. The stream concentration following this erosion is supposed to have furnished the bulk of the gold accumulated by the Incas. These people had even attacked the low-grade gravel hills, and removed material aggregating millions of cubic yards. The length of time during which these deposits were worked by the Incas must have been enormous. The region well merits the attention of the modern miner whose skill and economy may find in Sandia a favorable opportunity for successful application.

Bureau of Mines.

On another page we publish a thoughtful letter discussing some features of the proposed National Bureau of Mines. The letter is from Mr. H. Foster Bain, State Geologist of Illinois and a mining engineer of high rank. He is particularly well qualified to express opinions and to make suggestions in the matter, because he has taken a prominent part in the promotion of the Bureau at Washington. A bill passed the House, and, after a favorable report from the Senate Committee on Mines and Mining, it awaits the approval of the Senate. Meanwhile, the Director of the Geological Survey has suggested that this new bureau be called a Bureau of Mining Technology, so as not to trespass on the province of the Survey. Mr. George Otis Smith says that "geologic studies form the foundation of the mining industry", and therefore the word 'mining' by itself "is inappropriate for a bureau that would conduct only a part of the investigations that relate to mines and mining." We wish that it might be said without cavil that geologic study is at the foundation of mining as now practised; it ought to be, but it is not: the pick and shovel, aided by muscle, and then by steam, constitute the fundamentals of mining, and that is exactly why the Geological Survey is deemed an inadequate guide to the safe conduct of an industry in which human life is risked and complex business interests involved. Naturally, the Director and his coadjutors are anxious to conserve the prerogatives of the Survey, and our readers, all of whom must necessarily be highly appreciative of the work that has been done, and is being done, by the Geological Survey, will hope that the new bureau can be established without injury to the one already in existence; nevertheless, the problems coming within the scope of the proposed bureau are so diverse and important that its administration will not likely be subordinated to that of the Survey. Frankly, this not unnatural jealousy, already imminent between the two bureaus, had best be overcome by placing them on an equal footing under a strong chief. The Geological Survey and the Mining Bureau ought to be under the Secretary of Commerce and Labor, for it is obvious that he is the officer of the Federal Government in closest touch with industrial conditions. The Survey would gain by being more strictly devoted to the purpose for which it was founded, and from which it has departed in statistical and hydrographic excursions that have dimmed a reputation for scientific work of the very first class. We know that some of its statistics are not as reliable as some of those collected by private enterprise; this is a great pity. The fuel investigations have yielded insignificant scientific and practical data, and have not advanced the state of the art in fuel economy. We do not impugn the devotion to duty nor question the scientific training of the gentlemen in charge of this work, but they are not fitted by previous experience to perform

the office of technical leadership. In the hands of a man like Mr. William Kent the work would have yielded results important to the scientist and to everyone interested in the industrial application of fuel-energy. The Bureau, on the other hand, should facilitate the systematic investigation of mining and metallurgical problems without trespassing on industrial initiative; it should co-operate with the State governments in ascertaining the causes of mine accidents; it should have charge of statistical work, in friendly co-operation with the geologists of the Survey.

Whether the Bureau should conduct experiments in practical problems of mining, ore-dressing, and metallurgy is open to question. The tendency of such concentration of experimental studies into the hands of a few would be to discourage investigation by the many, and to limit scientific progress to narrow grooves. By giving undue prominence and authority to the work of a small corps of experimenters, no matter how great may be their talent, the broader ends of scientific progress are not attained. The Agricultural Department has avoided this pitfall, and doubtless a Mining Bureau could follow the trail blazed by the guardian of this other field of primal wealth. But the co-operation of State experimental stations is not necessarily the best, nor even the sufficient, means for carrying out this particular phase of paternalism in government. Many colleges and universities possess equipment in men and laboratories that under special arrangement could be utilized, thus supplementing the financial ability of the universities to conduct valuable investigations. Such work, moreover, being done in institutions of learning, would immediately enlist the interest of students; this in the aggregate would immensely further the dissemination of new knowledge, and stimulate fresh research to a degree unattainable through the mere distribution of bulletins. We do not believe that the Agricultural Department has elaborated the most efficient plan. The Mining Bureau could do better. Certain it is that investigations of this kind should be conducted in such a way as to receive impetus and direction from local needs in every part of the country. The tendency of any Bureau is to fall under the influence of a few special industries, and of a few important operators. This tendency is enhanced when the activities of the Bureau are concentrated at one place. We believe that in Canada it has been customary for the Provincial governments to entrust scientific investigations to specially competent men in the universities, without regard to political or other bias. From this we may take a hint. It is better than a commission, which is prone to find in the work an occasion for diversion in a holiday jaunt; it is better than the routine performance of men who may by mere good fortune happen to be the best ones to conduct the investigation with enthusiasm and ability. Moreover, the college professor is more likely to take a scrupulously conscientious view of moral responsibility toward the people than one who has a tender regard for the continuance of a salary from the public coffers—save the mark!

A Mining Bureau has a particularly useful function to perform in opposing waste—not only profligate dissipation of natural resources, but waste of effort through ignorance and the easy drift along conventional channels. We are today taxing the people with an excessive tariff to make iron, while wealth is being flung into the air from flaming coke-ovens with a disdain of future needs that will make us seem crude barbarians in the eyes of our descendants. The Bureau would find large opportunity for proving its right to exist by helping to rationalize industry in the conservation of mineral resources, which, once taken from the earth and used, are irreclaimable. We know that the leading technical and professional men in the West are taking a keen interest in this subject; we hope that they will express their opinions freely in the columns of this journal.

Dredging Consolidation.

Dredging in California is becoming increasingly important. A consolidation just effected emphasizes this importance by the largeness of the capitalization involved. The Natomas Consolidated of California is a corporation controlling 6000 acres of dredging land and operating 14 dredges; it is a consolidation of the Natoma Gold Dredging, Folsom Development, Feather River Development, El Dorado Gold Dredging, and Ashburton Mining companies; besides sundry additional tracts of dredging lands not owned by any previously formed company. The capitalization includes $25,000,000 in bonds and $25,000,000 in stock. The dredging portion of the enterprise supports half of this capitalization, the remainder covering reclamation of land, sale of water to Sacramento and its suburbs, and other allied enterprises. The president is Mr. Frank Griffin, who is to be succeeded shortly by Mr. E. J. De Sabla, Mr. Griffin becoming vice-president, together with Mr. Louis Sloss, of the Alaska Commercial Company. Mr. W. P. Hammon will be managing director, and will give his unique knowledge of dredging operations to the furtherance of this important enterprise. This places an enormous amount of dredging work under Mr. Hammon's direction, for he is general manager already of both the Oroville Dredging and the Yuba Consolidated. The latter is the largest gold dredging enterprise in the world, for it operates 12 dredges, produces over $1,600,000 per year, and pays $1,200,000 in dividends. We understand that the Natomas Consolidated expects to earn a profit of $900,000 to $1,000,000 in 1909 from the dredges, increasing this to $1,250,000 or $1,500,000 in 1910. The 6000 acres of dredging land are expected to give a life of 17 years to the undertaking. Three dredges are to be built shortly, the total number of machines increasing to 17. The ground to be worked is near Folsom, in Sacramento county, and near Oroville, in Butte county, California. The ground is estimated to average 10½ cents per cubic yard and the cost of dredging is expected to average 4 to 4½ cents per yard. Having regard to the marked revival of interest in this branch of the mining industry, we are glad to give our readers this information.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

ARTHUR S. EAKLE is at Bath, England.

R. C. SHAW is now living at Berkeley, California.

HAROLD RICKARD is now living at Zacatecas, Mexico.

BERTRAM HUNT has returned to San Francisco from Alabama.

T. C. SCRUTTON has returned to London from the Malay States.

E. M. HAMILTON is at the Dolores mine, in western Chihuahua.

J. C. BROWN has returned from Boston to Argentine, Kansas.

EDGAR RICKARD is making a flying trip to New York and Pittsburg.

JAMES E. JOHNSON, of Los Angeles, was recently at Durango, Mexico.

OTTO SUSSMANN has moved his office back to Salt Lake City, from Denver.

WALLACE, GLORE, & SUMMERHAYES, of Nogales, have dissolved partnership.

H. VINCENT WALLACE is in Lower California, examining manganese deposits.

WILLIAM M. BREWER has returned to Victoria from a trip to southeastern Alaska.

JAMES GAYLEY has resigned as vice-president of the United States Steel Corporation.

FRANK PROBERT passed through San Francisco, on his way from Rawhide, Nevada, to Los Angeles.

JAFET LINDEBERG has returned to San Francisco from Nome, spending a few weeks at Seattle.

FRANK A. LEACH, Director of the Mint, came to San Francisco to give testimony in the Ruef case.

J. NELSON NEVIUS, of Pasadena, has been investigating methods of dredging at Oroville, California.

T. S. DRUMMOND becomes superintendent of the Newhouse mines, in Utah, relieving LAFAYETTE HANCHETT.

R. V. NORRIS, consulting engineer to the Stone Canyon Coal Co., has returned from California to New York.

LEWIS T. WRIGHT has returned to San Francisco from a tour of the iron and copper regions of Minnesota and Michigan.

J. B. TYRRELL recently returned to Toronto from Sturgeon lake, in northern Ontario, where he examined several gold properties.

CHESTER A. THOMAS, manager for the Yukon Gold Co., is at New York, and is expected shortly at Santa Barbara, California.

CHARLES W. MERRILL has returned from Arizona, where he installed a precipitation press for the Alvarado Mining Co., at Congress Junction.

E. J. FRANZ, of New York, is in San Francisco, on his return from Plumas county, where he is manager for the Indian Valley Mining Co., at Greenville.

WILLIAM S. MANN, general manager for the Boston & Oaxaca Mining Co., has returned to Tlacolulu, in Oaxaca, Mexico, from a trip to the United States.

Obituary.

E. W. CHAPMAN, resident manager of the Channel Mining Co., was killed in the Chapman mine, near San Andreas, on Sunday afternoon, November 22. The accident was due to a cave of gravel from the roof, in a raise from the main gangway about 150 ft. from the main shaft. Although death was probably instantaneous, Mr. Chapman's body was not crushed when recovered after six hours of strenuous exertion by the men working in 20-minute relays. Mr. Chapman was a thorough-going miner, a captain under whom it was a privilege to work, and whose word was as good as his bond. He never asked his men to go where he would not go; pick in hand he put in his last shift.

Dividends.

On December 4 the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 135, of $75,000. This makes the amount of dividends paid this year $855,000, and the total to date $10,671,000.

Latest Market Reports.

LOCAL METAL PRICES—December 3.

Antimony	12@16c	Quicksilver (flask)	$45@46
Casting Copper (scrap)	8½@13½c	Spelter	6¼@7c
Pig Lead	4.55@5.50c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Nov. 25. £. s. d.	Dec. 3. £. s. d.
Camp Bird	0 17 6	0 16 0
El Oro	1 6 3	1 6 3
Esperanza	3 3 0	3 2 6
Dolores	1 10 0	1 10 0
Oroville Dredging	0 8 9	0 7 6
Stratton's Independence	0 1 3	0 2 6
Tomboy	1 0 0	1 0 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Nov. 19.	Dec. 3.
Amalgamated Copper	84⅞	83½
American Smelting & Refining Co.	95	92
Boston Copper	16⅛	16
Butte Coalition	26⅞	27
Cumberland Ely	8⅛	8
Dolores	7½	7½
El Rayo	4	4
Giroux	4½	6¼
Greene-Cananea	11⅛	11
Indiana Sonora	4¾	4⅞
La Rose	7	6⅞
Miami Copper	13⅜	12⅝
Nevada Consolidated	18⅞	19⅛
Newhouse	6¼	6
Nipissing	11⅛	10⅛
Ohio Copper	5⅛	5⅛
Tennessee Copper	50⅛	44¼
Utah Copper	47	48
Yukon	4⅜	4⅝

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, December 3.

Atlanta	$ 20	Laguna	$ 1.30
Belmont	82	MacNamara	35
Booth	26	Manhattan Con	6
Columbia Mtn.	19	Midway	20
Combination Fraction	1.40	Montana Tonopah	81
Daisy	85	Nevada Hills	2.10
Fairview Eagle	30	Rawhide Queen	70
Florence	4.65	Sandstorm	20
Gold Bar (Bullfrog)	2	Silver Pick	12
Goldfield Con.	8.00	St. Ives	24
Gold Kewenas	27	Tonopah Extension	41
Great Bend	29	Tonopah of Nevada	6.40
Jim Butler	17	Tramp Con.	13
Jumbo Extension	25	West End	35

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

Wire out of order December 3.

	Closing prices. December 2.		Closing prices. December 2.
Adventure	9¾	Mohawk	69½
Ahmeek	110	Nevada Con.	19⅛
Allouez	38½	North Butte	86½
Amalgamated	82½	Old Dominion	58½
Arcadian	4½	Osceola	125½
Atlantic	17¾	Parrot	30
Boston Con.	16⅛	Phœnix	60
Butte Coalition	27⅛	Quincy	95½
Calumet & Arizona	120½	Rhode Island	6
Calumet & Hecla	675	Santa Fe	2½
Centennial	34	Superior & Pittsburg	19
Copper Range	81¾	Tamarack	83
Daly-West	10½	Trinity	17¾
Franklin	17½	United Copper Con.	14⅜
Granby	103	Utah Copper	46¼
Greene-Cananea, ctf	11	Victoria	2½
Isle Royale	23½	Winona	7
Mass.	7¼	Wolverine	150

General Mining News.

ARIZONA.

COCHISE COUNTY.

It is said that Joe Larrieu, of Benson, and C. E. Rule, of Tucson, are also interested in a project to erect a concentrator at Paradise, and that a stock company will possibly be organized.——The Willie Rose Co. expects to resume operations in its property near Portal early in December and is asking for bids for sinking 50 ft. in its 27-ft. shaft.

GRAHAM COUNTY.

The first carload of machinery for the New England & Clifton Copper Co.'s aerial tramway arrived at Clifton this week and will be transferred to the Copper King mine at once. Two more carloads of material are due in the near future, after which the local management will rush installation. The new compressor, hoisting plant, and drilling machinery are now in operation and upon the completion of the aerial tram the Company will be in a position to greatly increase ore shipments and reduce the cost per ton.

MOHAVE COUNTY.

The Lyons Gem Co., of New York, has contracted for the purchase of a large acreage of turquoise land at Mineral Park. A representative of the Company was at the Park last week and took over the mines of John and Cordelia Kay, John Caswell and John Gross, and entered into a working arrangement with those owners. The Company purposes to handle the stones at its own laboratory in New York and the owners of the mines are to participate in the profits accruing from the product. They also get a good price for the mines and are to have charge of the respective properties.

YAVAPAI COUNTY.

Machinery is being installed at the property of the Black Mountain Copper Co., seven miles east of Jerome Junction near the north end of the Black Hills range. The new equipment includes a 150-hp. boiler, a 60-hp. hoist, a five-drill compressor, and a sinking pump. The shaft is now 125 ft. deep, but it will be sent down several hundred farther, cutting levels at each 100-ft. point.——The New York syndicate, which recently purchased the Etta mine, is putting up a 10-stamp mill and will later build a cyanide plant. The company is driving at the 160-ft. level of an old shaft. There is a large tonnage of ore exposed in the old stopes ready to be mined as soon as the mill is finished. The Etta is five miles west of the Verde river and 18 miles south of the United Verde mine at Jerome.——T. W. Wampler, who recently purchased the Peterson group of Octave, has cleaned out the lower adit, put the track in, and equipped the blacksmith shop. A contract for 100 ft. of driving is to be let at once. A trail, with a maximum gradient of 10%, is being constructed from the old Johnson road to the mine. It will later be converted into a wagon-road.——It is probable that the United Gold Co. will build a cyanide plant at its 4-stamp Nissen mill on the Alaska group near Congress. J. H. Morrison is master mechanic.

YUMA COUNTY.

An Indiana mining syndicate has taken a lease on the Bell of Arizona mill, at Quartzite, and will treat the ore from the Virgin Queen mine. H. H. Lahr is manager.——A strike of $100 ore was recently made on the Ironwood claim in the Kofa district. The vein is 12 ft. wide and is only 1000 ft. from the well known Ready Money property. Frank Payne, of Kofa, has recently purchased the Ironwood.——Ernest A. Haggott, of Los Angeles, has let the contract to the McEntee Bros. to sink a 100-ft. shaft on the south Cholla group of claims about 7½ miles south of Salome. The shaft is to be put down at a point about half a mile southeast of the Cholla shaft now down 40 ft.——The Harqua Hala Co. will, it is reported, build a cyanide plant to treat the old tailing. Barney Quinn is in charge. ——The Ultimatum group, 9½ miles from Salome on the north slope of the Harcuvar range east of Tank Pass, has been bonded to a group of Houghton, Michigan, men. Two shifts are at work sinking a shaft which will cut the vein at a depth of about 200 feet.

CALIFORNIA.

NEVADA COUNTY.

(Special Correspondence).—Sinking has commenced at the Rose Hill, and a winze is being put down from the south drift, where the vein is exposed.——After three years' continual endeavor the Idaho-Maryland Co. has unwatered the Idaho shaft to the 1000-ft. level. The old pumps on that level have been placed in fair condition and will start up for the first time in eight years within a few days. From this point the west drift will be extended to intersect the main vein. The mill has been placed in first-class condition and 20 stamps will soon be dropping. The bins are full of ore from the 8-ft. vein on the 500-ft. level, and Bray Wilkins, who is manager, is completing arrangements for developments on an enlarged scale.——Frank Colvin and associates are pushing exploration and development work on the Norambagua North Ex. claim. It is likely that a strong company will soon take over the property.——Honolulu capitalists have bonded the Grover & Murphy claim, adjoining the Mountaineer on the north. H. B. Gray has been appointed superintendent.——The Kenton mine has been taken over by a new company and will be extensively operated. T. R. Garnier is superintendent.——The Washington M. & M. Co., operating the Giant King mines, has been reorganized and will at once push work on a larger scale. It is proposed to erect a 20-stamp mill and other equipment. The company is said to have ample capital to carry out its plans.

Grass Valley, December 1.

SHASTA COUNTY.

The dredge belonging to the Consolidated Gold Dredging Co. sank in Sacramento river near the mouth of Clear creek. The cause of the accident is not stated.——Di Nola & Wicker, owners of the Clipper quartz mine on Squaw creek, have succeeded in interesting New York capitalists in a lease and bond on the property, and considerable development work is to be done immediately.——The Balaklala smelter, at Coram, blew in last week after an enforced shut-down of several weeks. The tramway has been put into good working order, and the various weak points disclosed by the short run have been repaired so that there is now every probability of the plant's running continuously. A force of about 300 men is working at the two mines.

SIERRA COUNTY.

Charles W. Brown, representing a Los Angeles company, has taken a bond on the Uncle Sam group, near Forest, and is making arrangements to start work at once.——It is reported that Charles M. Root, of Sacramento, is preparing to build a five-stamp mill on his property near Gibsonville. ——The Reese Ravine mine will be worked all winter under the management of W. C. Oaks.——Excessive water in the shaft at Poker Flat has made the installation of a pump imperative and M. Duvall is in San Francisco to procure it, and also a drill.——The Brush Creek and Ante-Up quartz mines have been bonded by F. L. Cole and Frank R. Wehe to L. L. Battey of St. Louis, who will re-open the long cross-cut adit in the Ante-Up and extend the drift to the ore-shoot in the old Brush Creek mine. L. A. Armstrong, formerly with the Elkton Consolidated at Cripple Creek, will have charge of operations.

TUOLUMNE COUNTY.

A new air-compressor has been put in at the Riverside, above Columbia. A large quantity of water-pipe was delivered at the mine last week.——Operations have ceased for the winter at the Grant mine, near Italian Bar.—— An 18-hp. gasoline engine has recently been put in at the Ethel mine, near Big Oak Flat.——The Nervy Gold Mining Co. filed articles of incorporation in the office of the county clerk last week. Capital is listed at $50,000 and shares are $1 each. The directors are M. A. Colby, Los Angeles; J. B. Bernon, J. W. Bennet, F. M. Colby, K. M. Nealon, San Francisco. Columbia is the principal place of business.

COLORADO.

CHAFFEE COUNTY.

A strike of rich ore was recently made in the Banker adit at Winfield, in Clear Creek gulch. The vein is 5 ft. wide and is said to assay 8 oz. gold, 37 oz. silver, 9% lead, and 34% copper. The property is owned by a company of Allentown and Philadelphia people. Plans for sinking a three-compartment shaft are being considered and one firm has already had an engineer make an estimate.

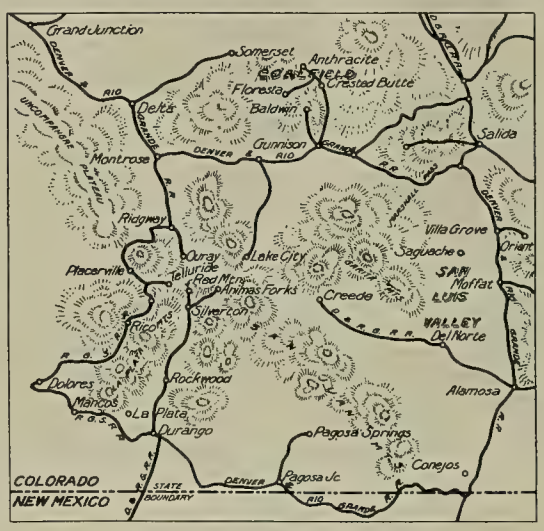
CLEAR CREEK COUNTY.

(Special Correspondence).—Some time during December work is to be resumed upon the holdings of the Democrat Mtn. M. M. T. & D. Co. It is reported that the bond issue of $100,000 has been placed and that the Kelly adit, now in 2800 ft., will be driven ahead for the intersecting of the series of veins controlled. Work will also be carried on in the Moline adit, the portal of which is 700 ft. farther up the hill. Driving is to be started on the Boston vein, where large reserves of milling ore are showing. F. Brownley is superintendent.——Shortly after the first of the year work is to be resumed on the East Griffith mine, on Griffith Mtn. The 50-ton mill will be started and driving and sinking will be carried on. A new company is now in process of organization and it is understood that ample funds will be available for the carrying of all plans to a successful issue. A report was recently made by an expert, who estimates that there is blocked and ready for extraction $1,000,000 in silver-lead ore. W. D. Hoover, of Denver, is manager.——Work will be resumed next week on the Sporting Times mine, Alpine Mtn. The drift is to be continued for about 300 ft. to permit of putting through a raise to connect with the old shaft workings. A. H. Colburn is owner.——A force of 40 men is now being employed at the Wilcox and Tobin adits by the Waldorf Metals Co. The Wilcox bore is being driven ahead, and is now into the hill over 5200 ft. What is believed to be the Paymaster vein was intersected during the last week, a streak of heavy lead ore being uncovered that is from 18 in. to 2 ft. wide. Assays show more than $100 in silver and lead. D. F. Sprousse, the manager, states that the adit will be driven for at least 400 ft. farther, as two veins will be intersected that are held under lease. During the coming month electric power will be turned on to the transmission line running to the Tobin adit, after which Shaw stoping drills will be brought into use.—— Within the next week the working force at the Terrible mine, Brown Mtn., will be increased to at least 40 men. The preliminary work now under way is progressing satisfactorily and within the near future driving will be started easterly from the eleventh, twelfth, thirteenth, and fourteenth levels. Heavy shipments are being maintained by the various lessees at work on the fourteenth level, contents averaging $100 per ton in silver and lead. B. C. Catren is manager.——The Josephine property on Kelso Mtn. is making a fine showing. J. R. Sapp, the manager, is employing a force of men in carrying a stope, as well as in driving the adit, which is now in approximately 1000 ft. ——The Conqueror M. & M. Co., operating on Covode Mtn., has entered into contract with the Two American Sisters M. M. P. & E. Co. for the furnishing of 100 hp. from the electric plant, two miles below Georgetown. Machine-drills have been ordered and the equipment will arrive during the coming month. The same Company is running a transmission line into the town of Empire and electricity will be sold to the residents of that place, as well as to a number of operating mines. J. J. White is manager.——The best paying lease in the Empire district is that operated by A. Thoman below the sixth level of the Gold Dirt. Stoping is in progress upon a body of ore that is from two to four feet wide and average returns of six ounces gold are being received. A force of from 15 to 20 miners is employed. Jacobs & Horstman, leasing on the third level, have a body of ore that is from 18 in. to 2 ft. wide, and returns five ounces gold. Sixteen sets of lessees are at work in the various parts of the mine and the output for the present year will be heavier than at any time during the history of operations.——The LaNeva M. Co. is employing a force of men in the advance of the U. S. adit, which is situated on Chicago Mtn. Driving is in progress upon several veins that have been intersected, chief among which are the Washington, Crosscut, Harrison, and Ohio. E. R. Fitzgerald, of Idaho Springs, is manager.——Fred Nye, manager for the Banner Con. M. Co., states that work will be started at once through the Centurion adit. Driving will be started upon the Centurion vein and the Rockford adit is being driven ahead, ground being broken at the rate of from five to seven feet each day.——The transformer station for the Central Colorado Power Co., at Idaho Springs, is nearing completion and shortly after the first of the coming year electricity will be furnished throughout the counties of Clear Creek and Gilpin. The United Hydro Co., of Georgetown, has contracted for 4000 hp. and will be the distributing agent. Already a number of contracts have been made with large operators.

Georgtown, November 28.

GILPIN COUNTY.

It is reported that a good strike has been made on the Rockford property in Russell district, which has recently been started by Sherman T. Harris and associates. The property is almost under the dump of the Topeka mine, and a whip has been put up for temporary purposes. The find was made at a depth of 75 ft., and it is reported that there is about 2½ ft. of smelting and milling ore in sight. ——The Frank Augustus Mining Co. last week took over the tungsten properties on Beaver creek, two miles north of Rollinsville, known as the Tanner & Dunn and Wilson & Ogilvie groups, the consideration being $50,000, on which a substantial cash payment was made, the rest to be paid within 60 days. About 25 men are at work on the property and this force will soon be doubled. Arrangements are being made for electric power from the Eastern Colorado Co. to operate the compressor and hoist, and early next year a large concentrating mill will be built. From three to six cars of ore per week are being shipped.——Chamberlain & Co. have taken a contract for driving the 150-ft. level below the adit of the Mabel property at the junction of Russell and Willis gulches. The contractors have also taken a lease and during the past month shipped one lot of smelting ore which gave them net returns of $46 per ton. The property is owned and operated by the Vigilant G. M. & M. Co., in which Denver and Eastern capital is interested. ——The Jefferson M. & M. Co. has taken a lease and bond on the Ralls County group of three claims on Quartz hill, which is owned by Charles Gage, of Columbus, Ohio. Pennsylvania capital is chiefly interested in the new operations and the management of the property has been placed in the hands of J. F. Shaw. There is a modern plant of machinery and shaft building over the main shaft, which is down 700 ft., and operations have been commenced in the 300-ft. level.



Map of Southwestern Colorado.

LAKE COUNTY.

Work has started on the A. Y. & Minnie property in California gulch. It will require a month or six weeks to get the shaft and workings in shape to start mining. T. A. Monahan is superintendent.——Plans are under way for resumption on the Huckleberry property in the St. Kevin district. This mine was closed a short time ago for repairs and a readjustment of its lease. An excellent streak of gold ore was being worked at the time the property shut down.——The Leadville Light & Power Co. is making electrical connections with the property of the B-P Mining Co. on Rock hill, which has taken a lease on the Buffalo, President, Comstock, and other valuable claims in that district. The Company is financed and managed by a concern of Eastern mining men who will exploit the property which they now control. A plant of the latest and most improved machinery is to be installed.

IDAHO.

BONNER COUNTY.

C. C. Titus, superintendent of the new Panhandle smelter at Ponderay, has returned from an ore-buying trip in the Couer d'Alene. He is now looking for additional contracts to supply the second furnace, which is to be blown in not later than January 1. The smelter will have a large amount of ore from northeastern Washington, in which a number of properties are ready to ship. None has yet come from the Metaline district, on account of the difficulty and expense attached to handling it several times, due to mixed river and railway transportation. One of the new roasters has been put in use and the third is nearing completion. The plant is handling from 115 to 135 tons of ore per day, most of it coming from Idaho and Montana. It is expected that shipments from the last named State will be increased next month. The management is preparing to ship two cars of bullion to the refinery at Carnegie, Pennsylvania.——The Chihuahua group of claims has been sold for a consideration of $60,000. A syndicate of Eastern capitalists has purchased the group from J. H. McDonald, of Rossland. Surveyors are now employed at the property in deciding on the nearest and most feasible route for transportation.

SHOSHONE COUNTY.

(Special Correspondence).—The question of the tariff on lead still continues to occupy the lime-light in connection with the mining industry of Shoshone county. A second delegation, consisting of W. Clayton Miller, C. W. Beale, Harry L. Day, James F. McCarthy, and Frederick Burbridge, has gone to Washington in the interests of the lead tariff. This committee, which represents the prime mining interests of the district, will act in co-operation with the delegation of business men already sent to Washington. H. F. Samuels, the pioneer of the zinc industry of the Coeur d'Alene, has also gone and will join with the Missourians in their fight for a zinc tariff.——The Hecla Mining Co. has declared its regular monthly dividend of two cents per share, involving the distribution of $20,000. This is the sixty-fourth dividend declared by the Company, making a total disbursement for this year $160,000 and the grand total $1,680,000.——The Alice mine, on which a splendid strike of ore was made some time ago, will, it is reported, erect a concentrator next spring. The present needs of the mine will be met by the erection of store-houses. The principal owners of the mine are Wilson & Mackay, of Portland.——The first shipment of ore from the property of the Caledonia Mining Co. will probably be made in the course of the next ten days, and if the results are satisfactory shipments will be continued at regular intervals. The property is regarded as one of the most promising in the district and is equipped with everything but a concentrator. C. Fred Kratzer and Charles McKinnis, of Wallace, are the principal owners.——John Huetter and T. A. Paterson, of Spokane, have just completed an examination of the King of Pine Creek property on behalf of a syndicate of Spokane capitalists, with a view toward taking over the property. The men expressed themselves as well satisfied with the outlook, and if the deal goes through it is the intention of the new owners to equip the mine with a full line of machinery, including a compressor plant, to be driven by water-power.——A 50-ft. contract, carrying a bonus of $1000 if ore is struck within the next 25 ft., has been let to Philip Goggins on the O'Peachy property, on Nine Mile. This work will be devoted to an extension of the adit, which has already been driven about 450 ft. Some good ore has been opened up and two cars have been taken out and are awaiting shipment. The principal owners are Patrick Brady, Louis Sherrier, and William Goggins, of Wallace.——The New York group of claims in the Delta district has been bonded to a syndicate of New York capitalists. The property was originally owned by the Wake Up Jim Mining Co. It is the intention of the New York people to erect a stamp-mill and operate the property on an extensive scale. Under the old ownership several shipments were made, in which the ore netted about $70 per ton. The principal owners are Jerry Savage, Frank Gauthier, and W. A. Udick, all of Delta, Idaho.——There is a report current in Wallace to the effect that F. W. Isham, a promoter of Spokane, has bonded the Fanny group of claims and will erect a stamp-mill after the first of the year. The group is about three miles north of Delta and is owned by the Ward brothers of that town. There is a large quantity of gold quartz ore on the dump awaiting treatment.——One after another complications appear to arise in connection with the affairs of the ill-fated Amador Mining Co. Last week the feature in connection with that mine was the discovery of a large ore-shoot carrying from 3 to 35% copper, the existence of which had been concealed by plastering with a layer of dust. This week comes the report that the stockholders committee has met in Chicago and passed resolutions denouncing the directorate of the Company, and at the same time arrived at a decision to refuse to pay the assessment recently levied and carry the matter into court if necessary. The meeting is said to have been attended by about 200 stockholders, representing 500,000 shares of stock. The report of this meeting comes as a sort of blow to local holders. It was felt in Wallace that the assessment would go far toward doing away with many of the present complications and that the management would be able to start both the mine and smelter at full blast in the near future. If, however, the company is to be plunged once more into litigation and the assessments remain unpaid the outlook is almost hopeless.

Wallace, November 28.

NEVADA.

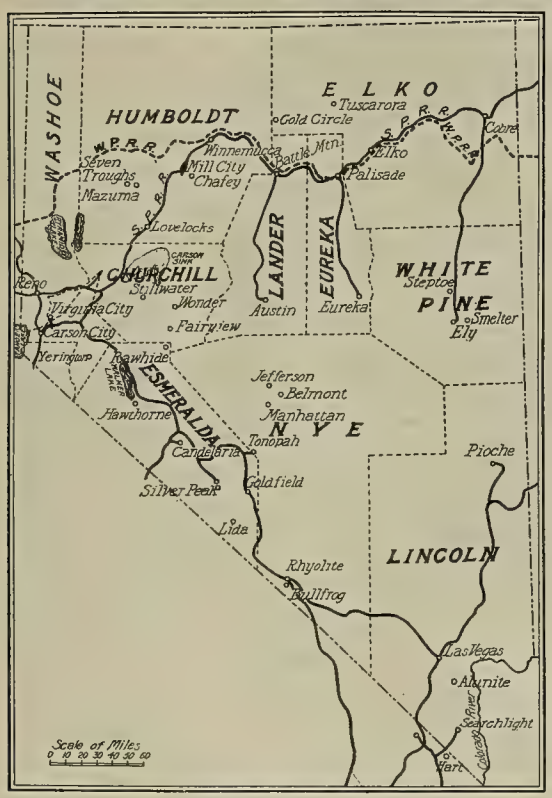
ESMERALDA COUNTY.

The lease formerly known as the Chicago Florence is being actively developed by the Nevada Florence Co., its present owners. The shaft is down 400 ft., where a station is being cut. Henry Bell is general manager.——An ore-shoot 6 ft. wide has been opened at the north end of the Mohawk Ledge block, on the 300-ft. level. Shipments are now being made, one 45-ton lot having been sent out. The find is believed to be an extension of the Sheets-Ish-Kalfus vein. Richard Fitzgerald, the superintendent, expects to make of the lease a regular shipper.——A. D. Parker, of the Goldfield Florence, announces that hereafter his company will grant no more leases. The mill is nearing completion and the concern will mine and treat its own ore.——The Goldfield Brokerage Co. has secured a two years' lease on the Red Top Extension and has organized the Red Top Mining & Leasing Co. to work the property. The property leased is the Bulldog claim, a fraction almost completely surrounded by the units of the Goldfield Consolidated. The shaft, which is now down 250 ft., will be sunk to a depth of 600 ft.——W. J. Craig, general manager for the Red Metals Mining Co., operating near Walker lake, announces that his company will thoroughly develop its property, and from the strong surface indications hopes to make a big producer of copper within a short time.——The Great Western, at Hornsilver, is now shipping to the Belmont mill at Millers at the rate of about 250 tons per month, and this will be materially increased in the near future.——It is still impossible to obtain production figures from either the producers

or the ore handlers. Very little was done by the Nevada Goldfield last week, and the Western Ore Purchasing Co. handled less than the usual amount. The Combination and Chlorination plants ran full force. Shipments were made from the Little Florence, Daisy, Eisen dump, Florence Annex, Consolidated Red Top, and Black Butte. Several thousand tons of ore was sent by the Consolidated to the new mill. The Mushett and Hazel Queen will have a good output next week. The total output was not in excess of $100,000.

HUMBOLDT COUNTY.

The Hero Nevada Mining Co., owning the Wildcat and Little Hero property, northwest of Farrell, upon which the remarkable discoveries of the last few weeks were made, has decided to make a mill run of its available ore at the Harras Demarest mill as soon as the latter is ready for action.——The Mazuma Consolidated Mill & Leasing Co., operating the Prior-Chadbourne lease on Mazuma hill, have cut the Reagan vein in the west cross-cut from the 250-ft.



Map of Nevada.

level of the mine. The vein was cut about 40 ft. from the shaft, and driving both ways on the vein is in progress. Work is being pushed as rapidly as possible and the indications are all most favorable.——The Seven Troughs Gold Mining Co., operating the Sandifer lease on the Therien property, is cross-cutting from the 150-ft. level of the shaft. The shaft is down below the level of Seven Troughs canyon, and the cross-cuts now being driven will give the greatest depth in the district. The Sandifer lease is being worked at a point supposed to be midway between Harnan and Reagan veins, and when these veins are reached phenomenal results are expected.

LANDER COUNTY.

Walter W. Wishon, who has recently taken charge of the affairs of the Austin-Manhattan Mining Co., has lately returned from San Francisco, where he purchased three gasoline hoists for use in the different properties of the Company.

LINCOLN COUNTY.

The Homestead M. & M. Co., composed of Colorado Springs men, has purchased the Duplex group of mines, at Searchlight, and already has a force of men at work overhauling the mill and moving the cyanide plant. Frank C. Brown is superintendent. It is said that among the future plans of the new owners is the sinking of a two-compartment shaft to a depth of 1000 ft.——Sinking on the new shaft for the Stratford has started. The site was selected by James Sterling, and is about 1000 ft. southeast of the old shaft on the Eddy claim.——A high-power pump is being installed at the 10th level of the Quartette mine, at Searchlight, to enable exploration for the orebodies at greater depth and to provide additional water for the milling operations. Thirty to thirty-five stamps are running, handling 100 tons of ore per day.

NYE COUNTY.

The Round Mountain Mining Co. has declared another dividend of 4 cents per share. It is payable December 18 to shareholders of record on December 15. The mine and mill are producing heavily and there is every assurance that the present rate of dividend will be continued indefinitely.——The Crown Point Globe Mining Co. declared a dividend on November 24 of one cent per share, payable December 20. The transfer books close at Johnnie, Nevada, December 15.——The Chapman mill, at Manhattan, a sale of which has been pending for several weeks, has been sold through Chris McCarthy. The purchasers agree to pay 40% of its indebtedness now and the remainder in six months. The mill consists of Huntingtons, with cyanide and concentration. It treats 50 to 60 tons per day.——The shipments from the mines of Tonopah for the week ending November 28 amounted to a total of 5387 tons, of an estimated value of $134,675.

NEW YORK.

Messrs. Behrend and Kidney, engineers of the Behrend Dry Concentrator Co., are examining the Grant mine at Carmel, in Putnam county, preparatory to erection of a concentrating mill of 50 tons capacity, under the Behrend dry system. The ore is complex in character, composed of sulphides and arsenates of iron, carrying copper, gold, silver, and nickel. On completion of the concentrating mill it is proposed to install a metallurgical plant for the recovery and separation of the arsenic and metals contained, by a new process. The crude ore has a gross value of $25 per ton, but on account of its refractory nature has at present no commercial value. The economic system evolved for the treatment affords means for highly profitable operation.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—Shipments of ore from the Lucile Dreyfus mine at Danville have been discontinued and two shifts of men are sinking the winze to a depth of 450 ft. Several shipments were made to the Northport smelter and gave returns of $8 in gold and copper. The property is owned principally by William R. Ridpath, of Spokane.——Developments will be started on the Belcher Mountain Mining Co.'s property at Belcher Mtn. this month, the financial difficulties having been settled and capital advanced by the Winnipeg stockholders to continue the work.——The Roselle Mining Co., owning 320 acres of mining claims, carrying a vein of tungsten, has been taken over by the Germania Mining Co., which has been working a portion of the vein under a misunderstanding as to titles. The latter had spent $75,000 before lawsuits compelled the relinquishment of work. The case is now before the Supreme Court of Washington, where it will be dismissed on motion of the Germania people. The amount paid for Roselle stock exceeds $50,000. William Scheck, local manager for the Germania, is now at St. Paul, attending to final details.——The Blue Jim Mining Co., which owns five claims on the Pend d'Oreille river, has begun development on a new copper lead, which yields high-grade sulphides at the surface.——The New Republic Mining Co. reports 11 men employed and the intention to increase the force. The upper levels of the Republic mine, after several years of idleness, are in a bad condition and will require consid-

erable work and a great deal of new timbering. Some prospecting is being done, and ore is being extracted in small quantities from the old stopes. A rich streak was left by the old company in the floor of the No. 4 (or mill) adit-level. A winze was sunk on it, and it pinched at about 12 ft. below the collar. That streak is now being followed downward from a point on the vein about 25 ft. north of the winze, and, if it holds out, may prove a good thing. The old company opened a level from 100 ft. down the winze, by running drifts and cross-cuts, but found nothing to justify further work. The engineers in charge recommended either a vertical shaft or that the winze should be sunk 300 or 400 ft. deeper; but the company was deeply in debt, and the mine was subsequently bought in by Ferry county for taxes. Evidently the fate of the mine must depend on what may be found below the No. 4 adit-level, although there may be considerable ore yet found above it. ——Good reports are coming from the Oversight group, in Belcher district, and also from neighboring properties. The Belcher Mining Co. has resumed work, with Bruce White in charge. A drift is being driven northward on the vein, on the No. 3 adit-level, with the intention of shipping the ore and ascertaining its practical value as a smelting product. Twelve men are employed.——The Oversight M. & M. Co. has four men employed on the No. 36 shaft, which is down 44 ft. in solid iron sulphide ore, showing chalcopyrite from top to bottom.——Work has been resumed on the Churchill mine, on Belcher Mtn.——It is reported that the heaviest stockholders of the Winnipeg mine have bought the Rosalia interests in the Belcher Mining Co., and will soon resume work on the Belcher mine.

Republic, November 28.

OKANOGAN COUNTY.

(Special Correspondence).—In Moses district, near the Nespelum Indian sub-agency, the Apache Mining Co. expects to resume work in a few weeks on the Apache mine. It has produced some rich ore, many assays having run as high as $60,000 per ton in gold alone. Rich stringers of ore give average assays of $800 to $900 per ton in gold and silver, about 5% lead and 2 to 3% copper. The ore also contains antimony and zinc. An incline shaft was sunk 100 ft. on the vein. An adit was also driven 350 ft. to the vein, and from that point followed an 18-in. streak of ore 15 ft. on the 100-ft. level. A winze was sunk 50 ft. on the vein below the adit-level. The majority of the vein filling is white quartz, the most of it being low grade. At the bottom of the winze the vein is seven feet wide, one foot of it assaying from $40 to $50 per ton, and a rich streak five or six inches wide follows the foot-wall. In the summer of 1901 I was at the Apache and secured specimens of ore that assayed from $5000 to $9000 per ton. At that time John C. Wilson had purchased the Apache claim for $1300, sunk the shaft 60 ft., and paid for the claim from the first ore he shipped.——The Multnomah Mining Co. has driven an adit from Nespelem creek, near the Columbia river, nearly 1000 ft. into Dewey Mtn., going finally through about 20 ft. of vein material and then striking into rich galena. On the Multnomah group a shaft was sunk, following a wall on which was found a little ore. By accident a shot broke through the wall and disclosed a vein of good copper ore. ——The Double Header Mining Co. has a shaft 50 ft. deep on the Double Header claim and another 80 ft. deep on the Little Chief claim. A vein has been followed from the latter and found to split; one branch, which strikes toward the Double Header shaft, is being followed. From the bottom of the Double Header shaft a cross-cut shows the vein-walls to be 62 ft. apart, with mostly porphyritic conglomerate between them. On each wall is found from 18 to 20 in. of good ore, having quartz gangue and containing some ruby silver. There are also two or three stringers of ore running centrally through the conglomerate.——The San Merino Mining Co., composed of Seattle people, is operating a property near the Little Chief, and has two men driving an adit, the face being all in ore. The vein is very wide and appears much like that of the Little Chief, which it parallels.——The Rebecca M. & M. Co., one of the first to operate in Moses district, formerly found some fine ore, but 'lost' the vein and is now cross-cutting from the bottom of a shaft, in the hope of striking it again.

Republic, November 26.

MEXICO.

JALISCO.

(Special Correspondence).—The Mololoa Mining Co., Ltd., has been organized in Toronto, Canada, with a capital of $250,000, to operate the old Mololoa mines in the Hostotipaquillo district. Willet G. Miller, provincial geologist of Ontario, is the president of the Company, and Frank G. Stevens, of Etzatlan, this State, is managing director. The mines were purchased by the Canadian interests from Carlos Romero, of Etzatlan, who owned them for several years, and who took out a great deal of rich ore, some carload shipments netting as high as ₱10,000. The Canadians are now opening new territory, and are blocking out ore supplies for a projected reduction plant, to consist of stamps, concentrators, and cyanide annex. The Mololoa mines are believed to be among the oldest in this part of Mexico, having been opened by the Indians before the Spanish occupation. It is recorded that their first Spanish owner was one Tomas Treviño, and he worked them with such success that the jealousies of other Spaniards in the district were aroused. At that time a partner of Treviño was working the San Jose de Ventanas mine across the Santiago river in what is now the Jora camp of Tepic, and to communicate with him the Mololoa owner arranged a system of fire signals. This signaling was declared by his enemies to prove that he was 'conspiring with the devil', and formal charges to that effect were filed with the Holy Inquisition. Treviño was arrested and taken to Mexico City, and there tried, convicted, and burned at the stake.——The Carrizo Copper Co., of St. Louis, will blow in its 80-ton custom smelter at the town of Ayutla, this State, early in December. The smelter was completed last spring and was blown in for a trial run in June, after which it was shut down pending the close of the rainy season. The Company is buying outside ores, and is accumulating a big tonnage from the San Felipe, Zapatero, and Vesuvio mines near Ayutla, which were purchased last year from the Ayutla Mining Co. The production at these mines now amounts to 100 tons per day, and some of the ore runs over 12% copper and 200 gm. silver. The rich ore is sent direct to the smelter and the remainder concentrated at the mines. The Company has just purchased the Zora mine in the Ayutla district, the ore of which is high in lime and low in silica, and has a good content of copper and gold. The Carrizo enterprise is of the utmost importance to that part of Jalisco, as it places smelting facilities within easy reach of the mines of Ayutla district. In anticipation of the blowing in of the smelter much development is now being done and considerable prospecting is in progress.—— The Magistral-Ameca Copper Co. has been selected as the name of the concern that will operate the Magistral copper mines in the Ameca district of this State, which have just been purchased by Patrick Clark, of Spokane, and James P. Harvey, H. L. Percy, and Fred M. Lyons, of Los Angeles, for $100,000. The four men will hold all the stock. In addition to a 100-ton plant for dry concentration, a railroad line to give the mines and mill connection with the Mexican Central railway at Ameca, ten miles distant, will be built.——It is announced here that the Mexican Petroleum Co., of which E. L. Doheny, of Los Angeles, is president, is now supplying the Mexican Central railway from the Ebano fields in San Luis Potosi 6300 barrels of fuel oil per day. The contract price is 55c. per barrel. The Mexican Central is steadily substituting Ebano oil for coal as locomotive fuel, and during the coming year it is expected to have all locomotives equipped to burn oil. The Doheny company has secured a concession for the construction of a pipe-line from the Ebano fields to the high central table-land with a view to supplying oil to industries in Mexico City and other places.

Guadalajara, November 25.

Special Correspondence.

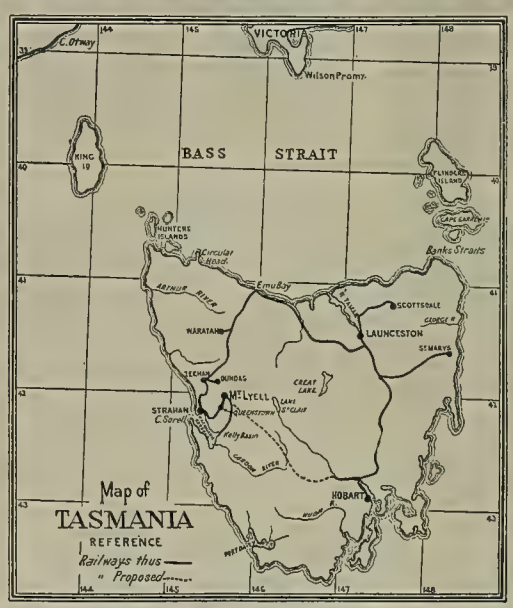
LONDON.

Institute of Metals.—First Meeting.—Electric Pumps.—Dredging in West Africa.—Mount Lyell.

The first meeting of the recently formed Institute of Metals was held at Birmingham on the 10th and 11th of November, and in every sense it was a great success. The Institute was founded during the summer and its origin is due to some extent to the requirements made obvious by the Alloys Research Committee of the Institute of Mechanical Engineers, though if it had not been for the special energies of W. H. Johnson, a great user of brass in Manchester, and Professor Carpenter, of the Manchester University, the Institute would never have taken concrete shape. The Alloys Research Committee of the Institute of Mechanical Engineers has been in existence for nearly twenty years. For a long time its functions were not fully developed, for the control was in the hands of Roberts-Austen, who did most of his research work in connection with the Committee on the study of the alloys of gold, which—to be quite candid—were not of great interest to the Institute of Mechanical Engineers. To cut a long story short, the Institute of Metals has now started on what promises to be a prosperous career. Birmingham was naturally a suitable place for the first meeting, as this city is noted for its metal trades, and possesses, moreover, an up-to-date university with an excellent metallurgical department. The secretary of the Institute, Gilbert Shaw Scott, has been identified with Birmingham University, where he studied and did metallographic research work under Professor Turner. The titles and subjects of the papers read at the first meeting give a good idea of the scope of the Institute. J. T. Milton gave a paper on various physical failures of copper and copper alloys either due to bad annealing or to the presence of various impurities. Mr. Echevarri read a paper on the present position of the metallurgy of aluminum, and Mr. Philip, chemist to the Admiralty, one on phosphor bronze. Messrs. Bengough and Hudson discoursed on the mechanism of annealing in the case of certain copper alloys; Dr. Desch and Mr. Rosenhain presented papers on special studies in metallography. Of course official Birmingham warmly welcomed the Institute and there were receptions, dinners, and all that sort of thing. Sir William White, late chief constructor to the Admiralty, was president and a distinguished list of vice-presidents was elected, including Richard Pearce, Norman Cookson, and Professor Gowland. The next meeting will be held in London next January.

In writing in this column about a year ago, I gave some particulars of the introduction of electric pumps in Cornwall for re-opening old mines and mentioned that in most cases there was great difficulty in making the pumps work. One of the instances I quoted was the Parbola mine, which is situated in the Gwinear district. The new owners, after trying a steam sinking-pump, put in an electric pump. Neither of these gave satisfaction. Finally it was decided that after all the Cornish pump takes a lot of beating and accordingly one has been erected. The surface plant, including 20 California stamps, is in course of erection and will be ready for work by the time ore is available. This mine is owned locally and the office of the company is at Plymouth. Another mine I mentioned a year ago was Wheal Vor, which is not far from Parbola. This old mine has been taken in hand by the Dolcoath people, and an electric pumping plant installed. Here again all sorts of difficulties arose, due to the failure of the contractors to make the machinery come up to expectations. A new electric pump of the Sulzer type was put to work in July last and unwatering has been going on since then regularly. The water-level has been lowered to about 500 ft. below adit, or 670 ft. below surface. The pump is capable of working against a head of 870 ft. and will deliver 72,000 gal. per hour. As sinking goes on, the old shafts are being repaired and timbered. Various levels have been cleared and tributer parties are busily occupied. The question of erecting a dressing plant is in abeyance until more exploratory work has been done. The working capital originally subscribed is exhausted and there is an overdraft at the bank. The directors will shortly formulate some proposal for providing additional funds.

The Offin River Gold Estates is a company that was formed some eight years ago to acquire 50 miles of river and 100 square miles of country on the Offin river in the Gold Coast Colony, West Africa. Two dredges have been at work since 1904 and during four years have recovered bullion worth £53,858. The last 12 months produced £23,808, so that the operations are now getting into miner-like shape. The actual working expenses during the last year were £10,714 at the property and £2160 in London, together with £2100 interest on debentures, thus leaving a working profit of £7834. Owing, however, to the considerable amount of expenditure in previous years, it is not possible to prepare a profit-and-loss account for the year. The capital issued is 200,000 shares of £1 each as purchase price, 52,917 shares for cash, and £30,000 of debentures. During the last few months 30,000 additional shares carrying preferential rights have been issued for cash with the object of



sending out two new dredges. One of these is at work already and the other will follow before long. A good deal of money has also been spent recently in blasting a channel through the numerous dikes that cross the river, so that now the dredges can be floated to any part between Dunkwa and the Prah river. The dredges used are not the heavy ones to which you are accustomed in the West of America, but are of light steel frame-work suitable for work in tropical countries and in shallow rivers running through jungles. I hope to be able soon to send you illustrated information about these dredges.

The cabled summary of operations at Mount Lyell during the six months ended September 30 shows that a larger profit has been made than during the previous six months, details of which I gave in your issue of June 13. The total production was 4450 tons of blister copper containing 4394 tons of copper, 336,654 oz. silver, and 9043 oz. gold. The total amount of ore treated was 199,969 tons, averaging 2.62% copper, 1.69 oz. silver, and 0.9 dwt. gold. In the previous half-year the copper content was only 2.46%, and the output of blister copper 4301 tons, a fact which accounts partly for the increased profit. At the beginning of the six months there were 908 tons of copper unsold. This has been disposed of, and there were 852 tons of the current half-year unsold on September 30. The average price for the copper sold during the half-year was £60 9s. The total

profits were £152,157, as compared with £128,980 during the previous half-year. Dividends at the rate of 1s. 9d. per share, absorbing £105,000, are being paid out of this and the balance, £40,100, of the debentures of the North Mount Lyell have been paid off. During the half-year the ore has been drawn from the open-cut at the Mount Lyell mine and from the 850-ft. level at North Mount Lyell. No special development work has been done at the Mount Lyell, so that the ore reserves above and below are the same as before, after deducting the output from the open-cut already mentioned. At the North Mount Lyell the developments have opened further supplies and the reserves have been increased by 103,675 tons, even after deducting 65,446 tons taken out during the half-year. The reserves at the North mine are now 710,333 tons, running 5¾% copper, 1.33 oz. silver, and one grain of gold. The outlook for the Mount Lyell Mining & Railway Co. is therefore excellent.

MEXICO.

Monterrey Steel Works Resuming.—Durango Iron & Steel Co.—San Miguel del Mezquital Mines.—Conejos Sulphur Deposit.—Penoles Mining Co.—Oil Developments in Chihuahua.

The rumored resumption of work by the Monterrey Iron & Steel Co. seems about to be realized. A force of men has been busy for some time over the necessary preperations, a large stock of between 25,000 and 30,000 tons of both coke and iron-ore has been received, and it is expected that early in December will see the plant in full operation, which will mean a weekly pay-roll of about ₱20,000. This has been made possible by a number of large orders, chief among which is one from the Mexican National railroad for 85-lb. rails, to replace the 70-lb. rails now in use. It is the intention of the Company to place heavier rails over the entire line between Mexico City and Laredo. The order given the Monterrey steel plant is for 75,000 tons of 85-lb. rails to be delivered over a period of two years, 20,000 to be delivered in 8 months. Should the steel plant remain in operation that length of time it will be the longest run that has been made there and will prove of great benefit to Monterrey.

It has also been recently stated that the Durango Iron & Steel Co., which has been idle for a number of years, has finally interested new American capital, and that all the old debts will be paid off and work resumed. This company owns a large portion of the famous iron mountain, known as the Cerro del Mercado, just outside of the City of Durango, at the base of which mountain the plant is situated. This immense deposit of hematite is one of the largest, if not the largest, known in the world, and is an ideal ore for the iron-blast furnace. Durango will await anxiously the realization of this report. Another hoped-for influx of foreign capital of interest to Durango is from Los Angeles, California. It is said that H. Winninghoff has been able to interest men of means in his San Miguel del Mezquital mines, situated in the valley at the edge of the town of that name 8 miles south of Catalina station, which is an hour's ride on the Mexican International railroad east of Durango. These mines have been idle four years or more, because of insufficient capital. A heavy flow of water, deep workings, and a complex ore (zinc, iron, copper, and lead sulphides, closely associated) call for expensive machinery and pumps as well as an immense concentration and separation mill. The property has large deposits of good grade, the difficulties being to obtain water and to effect a good separation of the several minerals. Mr. Winninghoff's long years of endeavor to interest capital seem at last about to be crowned with success. Another Durango property in which new life is being instilled is the only successfully operated sulphur deposit in Mexico. It is well within sight eastward of the little station of Conejos, on the Mexican Central railway. From Conejos the Durango Central railroad runs to the Descubridora camp, with a spur from Conejos to the mine. These sulphur deposits occur with gypsum along seams in lime, and are said to have been worked since before the Spanish invasion of Mexico. They have been worked in a very crude way, and in the reduction of the sulphur there has been great leakage and waste. Now, however, systematic mining is to be introduced and modern stills will take the place of the present crude furnaces. At Mapimí, west from Bermejillo, a short distance south of Conejos, are situated the mines and smelter of the Peñoles Mining Co., one of the largest and most successful independent companies in the Republic. Preparations are being made to carry new and systematic development to a considerable depth in the old Peñoles mine, as there has been nothing done in that particular mine below 200 metres, and ₱100,000 has been set aside by the company for that purpose.

Speculation has been rife in Chihuahua as to the plans, future operations, and results of the new oil company, known as the International Oil & Gas Co., with a $20,000,000 gold capital (probably largely on paper), which has just been organized in Indianapolis by C. R. Troxel for thoroughly exploring for gas and oil the lands held by Elberto Terrazas under concession from the Federal Government, dated June 2, 1908, as well as other leases, making in all several million acres in the northeastern corner of Chihuahua, between the Conchos and Rio Grande rivers, bordering on the State of Coahuila. This district was partly prospected last year by William R. Hearst and J. R. Keene, and it was then stated that oil was found in several holes at depths varying from 700 to 2200 ft., and that the average analysis of the oil showed:

	%
Naphtha and light oil	14.38
Kerosene	53.11
Lubricating oil	20.00
Paraffine	10.00
	97.49

The oil-sands were said to bear a close resemblance to those of Pennsylvania. Messrs. Hearst and Keene are supposed to be quietly acquiring ground in the vicinity. Mr. Troxel was also associated in that work, but seems to have broken away to handle the present enterprise, which has been examined by John S. Duffey of Pittsburg, reported satisfactory, and work ordered to proceed as soon as the drilling machinery can be placed on the ground.

PARRAL, MEXICO.

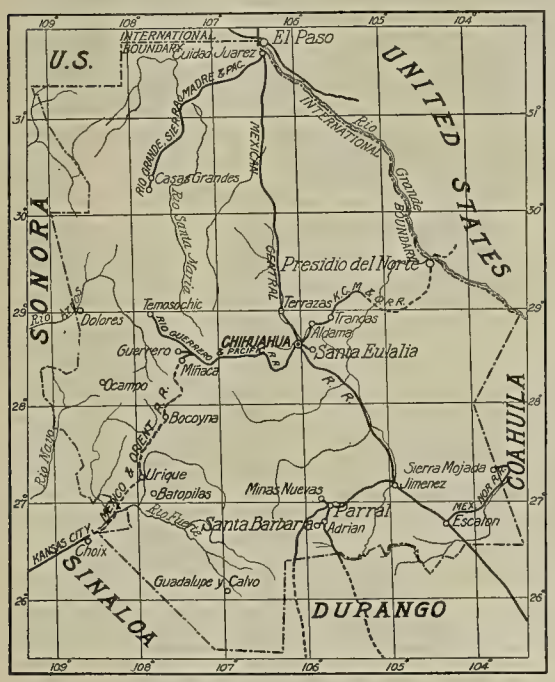
El Porvenir.—Recent Discoveries. — Cyanide Plant. — Rica Mole.—Providencia.—The Palmilla.—El Tajo.

The El Porvenir Co. is doing important work near Parral, under the direction of Nat. P. Wilson of Denver; other interested parties are M. E. Peters, G. W. Huddleston, and Juan F. Brandes. The old San Cristobal vein was profitably worked years ago, but in the course of its dip west the vein passed into ground now belonging to the El Porvenir Co. The latter has leased the 570-ft. shaft and bought the hoisting machinery of the San Cristobal, and is able to enter El Porvenir ground through these old workings. Mr. Wilson has also sunk a 415-ft. shaft on El Porvenir ground, 700 ft. south of the San Cristobal, from the bottom of which the vein is reached by a 60-ft. cross-cut. This is a fissure vein, between diorite walls, averaging 6 ft. in width. The ore consists of chloride of silver, accompanied by some gold, in quartz running, it is claimed, 50 oz. silver and $2 gold per ton. There is 400 ft. of drifts on the vein at the 400-ft. level. A third shaft is being sunk 800 ft. south, to intersect the same vein on its dip. Cross-cuts are to be driven from the latter shaft to a vein running parallel to the El Porvenir, ore from which runs high in gold. This gold vein was opened at another point by a 300-ft. shaft. The two new shafts of El Porvenir have electric hoists, and at the central shaft a new air-compressor, to be electrically driven, will be installed. An ore-sorting plant and shipping-bins have been erected, from which some shipments have been made. It is at this point that a cyanide plant is to be erected. The El Porvenir veins are on the same general belt as those of the Palmilla. Lying east of the former and

parallel is the Rica Mole group, belonging to J. H. Robeson, A. H. Reidel, and Nat. P. Wilson. It has one strong vein, with several cross-veins, the former being a fissure in the diorite. The old workings comprise a 265-ft. shaft and 600 ft. of lateral work. The ore is silicious, carrying silver and gold, with only a little lead. It is proposed to begin operations here in January.

The Providencia Mining Co., of Worcester, Mass., has a 70-acre group one mile east of the Palmilla. It has a series of veins striking northeast. The principal of these has been opened by an incline shaft 286 ft. deep and a vertical shaft 300 ft. Some driving has been done on the vein from the 300-ft. station, showing 3 to 5 ft. of ore carrying silver and lead, the lead occurring as galena and carbonate. At one of the shafts is a crusher, a set of rolls, and some hand-jigs, by which concentrate is being made and shipped. J. D. Barnes, formerly of Denver, is in charge.

The Palmilla, which delivers its ore from the mine to the railroad at Parral over a 2½-mile aerial tramway, is shipping some of its best ore but the principal effort is now being made to drive a 1500-ft. cross-cut from the base of the hill to tap the working shaft 600 ft. below the collar. This cross-cut will be used mainly for drainage.



State of Chihuahua, Mexico.

The Prieta, situated on the outskirts of Parral, belonging to the Parral Con. Mines Co., and managed by D. H. Bradley, has been shipping a car of ore per day up to a month ago, but shipments have been suspended for the present on account of the low price of silver, although development work is in progress. These ores are base and complex, carrying iron, lead, zinc, and silver. The silver occurs in the main as argentite, though there is a small part as a chloride. In the lower levels is some copper. This property has a complete plant, comprising an electric hoist, air-compressor, and ore-testing mill. El Tajo, a well developed mine adjoining the Prieta, belongs to the American Zinc Extraction Co., and is reported to be shipping 2000 tons of ore per month. The Hidalgo M. Co., managed by James I. Long, U. S. Consul at Parral, has 17 partly developed mines in the district, some of which have been good producers. Mr. Long is preparing to make some cyanide tests, and this is one of the indications that cyanide plants will become a factor in this district. James I. Long is at the head of the Parral & Durango Railroad Co., which operates a road from Parral westerly a distance of 75 kilometres. Chas. F. Gehrhardt and brother have taken a 10-year lease and bond on the La Buena and El Vulcan mines, 30 miles from Rosario, in Durango, on which they are beginning work. The properties are sufficiently developed to show a sulphide of iron and lead, carrying gold and silver. It is said to be high-grade.

ROSSLAND, BRITISH COLUMBIA.

Granby Consolidated.—Profitable Operation.—Boundary Output.—Dominion Copper.—Centre Star Group.

At a meeting of the board of directors of the Granby Consolidated M. S. & R. Co., held in New York on November 10, a 2% dividend was declared, payable December 15. For some time the local stockholders in this concern, and others who are directly or indirectly interested in the company's affairs, have been expecting action of this kind, and while rumors of a convincing character have been circulated throughout the district during the past two weeks, there was nothing certain until the official statement of the board of directors was published. This is the tenth dividend that the Granby company has declared since December, 1903, and will bring the total profits paid to December 15 next up to $3,508,630. The payment of this last dividend and that of June, 1908, being both on a 2% basis, representing a disbursement of $270,000, have a most significant bearing on the low-grade copper-gold mining industry of the Boundary district. They go to prove that the mining of the low-grade copper deposits that exist in the hills about Phoenix can be done at a fair profit, even with copper at an abnormally low market-price, and will effectually dispel the few doubts entertained when the Granby mines resumed on the first of the year. The average extraction per ton from Granby ore is 23.42 lb. copper, 0.2865 oz. silver, and 0.0454 oz. gold. For the year ended June 30, 1908, the average price received for copper was 13½c., from which figures it will be seen that a large tonnage must be mined and great economy exercised in mining and smelting the ore, in order that a profit may be realized for the stockholders. Up to and including the week ending November 21, 1908, the Granby company has mined at Phoenix, and sent to the smelter at Grand Forks, 930,435 tons of ore. It is officially stated that by means of the diamond-drill there has been developed and blocked out a greater tonnage than has been mined during the year; in other words, the reserves at this date are over 930,435 tons. The Granby company has fairly riddled the hill with diamond-drill prospect holes, and it is stated that the cores so far taken out, if joined, would measure over six miles in length.

The enlarged furnace at the Grand Forks smelter is operating satisfactorily, and it is now thought that this experiment will be a success, and that the other seven furnaces will be enlarged, one at a time.

With shipments from the Boundary district of 36,674 tons of ore for the week ending November 21, 1908, the total tonnage sent out from this district during the past nine years passes the 7,000,000-ton mark. Of this exceptional tonnage for a young industry, the Granby has contributed about 65%. As each year has rolled past the record of ore shipments has shown that the copper mining industry of the Boundary has assumed more important proportions and has more firmly established itself, and at this writing the future looks bright. Steady shipments are now being made from the B. C. Copper Co., Mother Lode, and Oro Denoro mines, as well as the Granby mines, while the Con. Mining & Smelting Co. of Canada is making regular shipments from the Snowshoe and is conducting developments on both that property and the Phoenix Amalgamated group.

The liquidator of the Dominion Copper Co. has succeeded in raising a sum of money, and the few men still employed about the mines, caring for the pumps, etc., were paid their wages last week, but the final arrangements for funds to meet the unpaid August and September payrolls have not been made. The work of establishing the concern on a reorganized basis is proceeding slowly but steadily. In the

Supreme Court at Vancouver the National Trust Co. of Toronto has asked for judgment of $800,000 on the mortgage they hold, given some years ago. The application was opposed. Frederick Keffer, well known as the consulting engineer for the B. C. Copper Co., examined the principal mines of the Dominion Copper Co. a week ago. No information has been divulged, and sentiment is divided as to whether the examination was made on behalf of large shareholders in the company, or whether the B. C. Copper Co. will endeavor to lease the mines, treating the product in their up-to-date smelter at Greenwood.

The Centre Star group, Le Roi, and Le Roi No. 2, Ltd., in Rossland camp, are producing steadily. Nothing has interfered with their regular production during the year, and they have made a fair profit on their operation. The Le Roi has paid off a large part of the company's debt, and there is a good body of ore in sight on the 1650-ft. level; the work in other parts of the mine is giving good results. A rich strike has been made with the diamond-drill in the Le Roi No. 2, Ltd., but the shoot will have to be driven on before anything definite will be known. Assays of the core show the vein contains $73 to $300 in gold, silver, and copper.

BUTTE, MONTANA.

November Output. — Anaconda Fire. — New Find of Copper near Ashcroft.—Interesting Details.—New Smelter.

In November the mines of the Butte district produced 28,363,400 lb. copper, against 28,864,410 in October and 29,055,000 in September. During the last 10 days of November the production of the Anaconda company was slightly curtailed on account of the fire in the Anaconda and Neversweat mines. Notwithstanding denials, there is reason to believe that the fire in the Anaconda mine is more serious than it has been at any time previously. The various companies contributed to the October total as follows:

Companies.	Tons Ore.	Pounds Copper.
Boston & Montana	100,500	7,638,000
Anaconda	114,000	7,182,000
Butte & Boston	20,100	1,246,200
Washoe	16,500	990,000
Parrot	12,300	713,400
Trenton	13,500	756,000
North Butte	42,000	3,864,000
Butte Coalition	28,500	2,280,000
Original	33,600	2,721,600
Pittsburg & Montana	6,000	480,000
Miscellaneous	6,000	492,000
Totals	393,000	28,363,400

A new copper district, from which the reports are so good that they seem almost incredible, is being developed near Ashcroft, B. C., by a number of Butte men. It is in an entirely new country, a virgin field, the property being situated 350 miles east of Vancouver and 12 miles from the Canadian Pacific railroad. It consists of three claims, a total of 156 acres, located along the vein. In British Columbia a claim is 1500 ft. square and is without extra-lateral rights. The ground was located about three months ago by G. H. Chattaway, who was prospecting, when W. W. McDowell of Butte heard of the find and visited the district, with the result that he took a three years' option at a big price. John Kerrigan, a practical miner, was sent from Butte to make an expert examination, and his report states that the Butte men have found one of the biggest copper propositions in the country. The vein, which is from 6 to 28 ft. wide on the surface, has been traced a distance of 2000 ft., and the samples taken from surface cuts and from an adit that is being driven on the vein at a depth of about 100 ft., give an average assay of 13% copper, the run of 14 samples being from 4 to 25%. The vein occupies a fissure in granite. About $7000 worth of ore was taken out in driving the tunnel, and the dump assays 13% copper. A point about 77 ft. ahead of the present face of the adit shows a width of 28 ft. of ore on the surface. There is talk of concentrating this ore, which would be absurd with so rich a smelting ore. If the development work proves satisfactory, it is the intention of the owners to build works on the banks of a lake about a mile distant. There are two large rivers within 10 miles of the mine, offering exceptional possibilities for power, and the country for hundreds of miles is covered with timber. Twenty-eight miles from the mine are the Nicolay coal mines, which furnish a fine grade of coking coal. The Canadian government has already signified its willingness to build a wagon-road to the mine, and the plans of the owners include the building of an electric road from the Canadian Pacific, a distance of 12 miles, and to the Nicolay coal mines. Many fine samples of bornite have been sent to Butte. No company has been organized; the parties interested are W. W. McDowell, W. E. Reynolds, C. J. Kelly, H. B. Byrne, Phil Gillis, Walter Lewis, Guy W. Stapleton, Geoffrey Lauzier, I. A. Heilbronner, all of Butte. J. W. Martin, formerly foreman of the Raven mine, is in charge of the development operations.

E. P. Mathewson, the Amalgamated Co.'s smelter expert, with a number of men, has gone to Utah to do the work preliminary to the building of the new smelter for John D. Ryan and associates, who obtained a contract from the Utah Consolidated to treat the latter's output for a period of 10 years. The first work to be done is to build a branch railroad from Tooele, on the Salt Lake road, to the site of the new smelter. As soon as the road is completed material will be hauled to the ground and work on the smelter begun. The new smelter is to be completed by April, 1910, and will have a capacity to treat 2000 tons of ore daily. The contract with the Utah Consolidated provides that the smelter shall receive of that company's ore up to 1200 tons per day. Its present output is 800 tons per day.

Montana.

The Butte Coalition is opening one of the biggest ore deposits in the Butte district. This big deposit is being developed in the Minnie Healy mine, on the 1400 and 1500-ft levels. Only one stope has been opened so far, but the big vein is being put in shape for a heavy production in a month or six weeks. At present the vein is mined through the Tramway shaft, but in another week the ore will be hoisted through the new Tramway shaft, with which all the new levels have been connected. The ore taken out at present from that vein assays 6% copper as an average. All the new workings of the Minnie Healy are below the fire, the fire in the property being confined to a portion of the mine above the 1100-ft. level where mining has been entirely abandoned. The fire is burning away from the Minnie Healy, and is worst in the Boston & Montana properties, adjoining the Minnie Healy. When the work planned on the lower levels of the Minnie Healy is completed a connection will be made with the old shaft from the 1600. The fire-drifts will be bulkheaded and, securely sealed

which will permit the company to mine the ore in that part of the mine. The Tramway shaft will become the main working shaft for the Coalition Co., and the old Minnie Healy surface plant is being dismantled. Nearly all the bulidings have already disappeared, and the head-frame has been lowered and taken apart. The old shaft has caved a great deal, and will be useful only as a chimney for the smoke and gas forming in the mine from the fire. The Boston & Montana has a great deal more trouble with the fire in that part of the district than the Butte Coalition Co., but is following the example of the latter: is bulkheading the upper levels and confining the fire, while a practically new mine is being opened at greater depth and under the fire zone. It is claimed that the fire originated in the old stopes of the Minnie Healy, which were filled with all sorts of waste, including hot ashes, by the former owners, when the Minnie Healy was one of the properties of F. Augustus Heinze and the United Copper Co. It appears that when a fire once starts in a copper mine it is impossible to extinguish it, and the only thing that can be done is to keep it confined and under control.

KALGOORLIE, WESTERN AUSTRALIA.

September Output.—New Type of Orebody.—Methods of Ore-Treatment.—Dust Prevention.

The usual progress reports for September from the principal mines indicate much work of a sound nature in the deeper workings. At 1960 ft. in the Boulder Main Reef shaft a promising lode was cut; at 1550 ft. in the Kalgurli mine good ore was cut, being 11 ft. in width; and at 2350 ft. in the Great Boulder fair ore is being worked, although not so rich as on the 2200-ft level. During the month West Australian mines produced gold valued at $2,950,000, the Kalgoorlie district returning $1,600,000 of the total. Dividends amounted to $380,000, making a total for the last 9 months of 1908 of $5,500,000, and a grand total to date of $91,000,000.

The September yields of the principal mines were as under:

Mine.	Tonnage.	Value of Output.	Profit for Month.	Dividends Paid.
Associated Gold Mines	10,180	$110,000	$38,000	
Associated Northern ..	3,680	40,000	16,000	
Golden Horseshoe	21,449	265,000	100,000	
Gt. Bdr. Perseverence..	18,035	131,000	26,000	
Gt. Bdr. Proprietary...	16,671	249,000	130,000	$325,000
Great Fingall	22,014	132,000	23,000	
Hainault	6,257	32,000	4,000	
Ivanhoe Gold Corp'n...	19,296	210,000	105,000	
Kalgurli	10,290	150,000	82,000	
Kalgurli South	9,031	61,000	11,000	
Lake View Consols....	7,878	61,000	11,000	
Oroya-Brownhill	11,440	80,000	20,000	
Oroya-Black Range	4,311	52,000	20,000	
Sons of Gwalia.....	12,705	91,000	28,000	
Sons of Gwalia South..	1,990	21,000	8,000	

The Sons of Gwalia South announces ore reserves of 25,150 tons worth $11 per ton; and the Ivanhoe at the end of June had 914,470 tons assaying $12.24 per ton. Arrangements have been completed whereby the Oroya-Brownhill Co. takes over the Brownhill Extended property. The former is now working the Brownhill, Brownhill Extended, the Oroya North and South Blocks, the Central and West Boulder, and Kalgoorlie Mint leases, all on the eastern side of the 'Golden Mile,' and connected with the Brownhill mill by an aerial tram and a light tramway for trucks drawn by horses. Until lately the Company kept its mill going on ore mainly from the Brownhill-Iron Duke lode. This is a peculiar orebody, unlike anything else on this field, and may be described as a pipe-like shoot of lenticular cross-section, the major axis of the lens dipping west about 30°, while the general course of the pipe is nearly due south, with a pitch in that direction of about 1 in 3. It outcropped in the Brownhill lease, entered the Extended at about 250 ft., cutting through one corner of that ground, entered the Associated Northern at 330 ft., leaving the southern boundary at 500 ft., entering the Oroya North block and traversing this, entering the Associated lease at about 1000 ft., where it gradually loses its shape and assay values. Although the orebody was worked for this great length, it had several breaks in each lease; still, it has been a wonderful shoot, and great quantities of tellurides, chiefly calaverite and petzite, and free gold were extracted. In the Brownhill kalgoorlite or coloradoite was found in fair amounts. From the Brownhill lease to the Associated the ore now being mined from the shoot is only of medium grade. It is reckoned that the Oroya had the richest ore near its boundary with the Associated Northern, but the following smelting results will give an idea of some of the ore shipped from the latter mine before its mill was erected:

Oxidized ore treated at local mills....	3795	tons for	$130,000
Smelted at Dapto, N. S. W., in 1900..	1077	" "	160,000
Smelted at Dapto, N. S. W., in 1902..	7046	" "	590,000
Smelted specimens	14	" "	92,000

The total gold won from the lode in its whole length to date is approximately $27,000,000 from 980,000 tons; and dividends amounting to $13,400,000 have been paid. Of these totals the Oroya-Brownhill has treated about 750,000 tons, obtaining gold valued at $21,000,000, and has paid dividends of $10,300,000; the Associated Northern treated 230,000 tons, yielding $6,000,000, and has paid $3,100,000 in dividends. Exact figures of production from the lode have been difficult to procure.

A short description of the treatment of the ore from this lode may be of interest, as two very different processes are in operation. The ore is of a schistose character, containing 60% silica, calcite, telluride, and pyrite, making a total sulphur-content of about 5 per cent.

The Oroya-Brownhill Co. crushes its ore in a fast-running battery of 50 heavy stamps, using no copper plates. The mill pulp is classified before going to the Wilfley tables, is re-ground in pans before going over more tables, and the whole pulp from the tables is ground to slime in tube-mills, settled, the thick slime run from the settlers into covered vats, agitated with KCy and bromo-cyanide, and filter-pressed, the residue being carried away by a belt conveyor to a dump containing perhaps 750,000 tons. The concentrate from the Wilfleys is roasted in Merton furnaces, ground in pans, settled, agitated with cyanide, and finally filter-pressed.

On the other hand, at the Associated Northern, the ore is broken in a Gates crusher, crushed through a 27-mesh wire-screen in No. 5 Krupp mills, roasted in Merton furnaces, ground to slime and amalgamated in pans, settled, run into vats, agitated with 0.06% KCy, filter-pressed, and disposed of by belt-conveyor. The extraction in both mills is from 90 to 94%, and the cost runs to $2.75 per ton at the Brownhill and $2.70 at the Associated Northern. Both plants have their little treatment-troubles, but on the whole the work is satisfactory. In years past there has often been a poor extraction, and after sampling the dumps at the two mines, it was found that the bulk would pay for re-treatment. The Brownhill is now erecting a Cassel plant of 15,000 tons monthly capacity; while the Associated Northern has been re-treating for some time upward of 2700 tons per month by mixing, agitation, and filter-pressing at a cost of 60c. per ton. This is interesting, as the Lake View Consols in re-treating 9000 tons monthly by the Cassel process has a cost of 62c., the extraction in both cases being about equal.

This is a windy month here, and the dumps have been blowing about in a disagreeable manner, making the Golden Mile unhealthy to work and live on, besides which the dust does much damage to the machinery, and the oil consumption rises. Several of the mines are arranging to spray their dumps with salt water from the shafts. Water used during the month at the big mines totalled 26,872,000 gal., ranging from 4,894,000 gal. on the Great Boulder to 634,000 on the Associated Northern.

SALT LAKE, UTAH.

Contract for Utah Con. Smelter.—Tooele Valley Railroad.—Changes in Management.—Pioche Mines Sold.—Railroad to Yerington.

The contract awarded by the Utah Consolidated Mining Co. to W. D. Thornton of Butte, Montana, whereby the latter agrees to provide smelting facilities for the treatment of ores from the Utah Consolidated mine in Bingham for a period of ten years, together with the announcement that the construction of a new smelter on the site selected for it by the Utah Consolidated in Tooele county, would begin at an early date, has been received with a display of profound satisfaction by Utah mining men. While the new smelter is intended expressly for the convenience of the Utah Consolidated, at the same time conditions have shaped themselves in such a way that when Mr. Thornton's company is organized it will enter the field as a vigorous competitor of the American Smelting & Refining Co., which at the present time has things nearly its own way in Utah, in so far as the treatment of copper ore is concerned.

The Guggenheims, or the American Smelting & Refining Co., who are minority stockholders in the Utah Consolidated, apparently have made a failure of their tactics in trying to block the erection of a competitive smelter in Utah. They even went so far as to threaten injunction proceedings; but President Broughton has found a way to avoid this, and shareholders of the Utah Consolidated have the option of subscribing for $500,000 worth of stock in the new smelting company, which will probably be done, if they have not already done so. A conveyance of all the land intended for use as a smelter site, together with water rights, smoke easements, and the like, has been made to Mr. Thornton, and when his company is formed it is said several persons prominently identified with the Amalgamated Copper Co. are to figure in the enterprise.

The construction of the new smelter is to be under the direction of E. P. Mathewson of Anaconda, who is to be chief engineer. It is expected that ground will be broken within the next month, and that the concrete work will be started before the end of the year; while the surveys for the standard-gauge railroad, to be known as the Tooele Valley Railway, have been completed, and in all probability the contract for the grading will be let within a week. This line will connect the smelter with the main lines of the Western Pacific and the San Pedro, Los Angeles & Salt Lake railroads at Black Rock, a distance of about 25 miles. One of the first things to be considered is the building of an electric trolley line from Tooele City to the smelter, about four miles away, which will be utilized principally in conveying employees to and from their work.

It now costs the Utah Consolidated Co. 40 cents per ton to get its ore hauled over the Rio Grande tracks from Bingham to the smelter at Garfield, aside from the expense of maintaining an aerial tramway 12,000 ft. in length. This freightage will be done away with entirely, for in the future ore will be conveyed direct to the smelter from the mine by an aerial tramway system only a little more extensive than the present one. It is claimed by President Broughton that the contract with the new smelting company will save the Utah Consolidated 67.6 cents per ton in the cost of treatment at the smelter; hence it does not take much figuring to show that the company will save $1 per ton, or approximately $300,000 per annum, on the basis of handling 800 tons of ore daily.

A change in the management of the Newhouse Mines & Smelters Corporation will occur on December 1, when Lafayette Hanchett will retire, to be succeeded by T. J. Drummond, the present superintendent. Mr. Hanchett, however, will continue to be general manager of all other enterprises of which Samuel Newhouse is at the head. Several changes will be made in the directorate of the Newhouse Mines & Smelters, and also in the Boston Consolidated, early next month.

Several mining deals involving property at Pioche, Nevada, were consummated at Salt Lake City last week, the purchasers being John A. Kirby, John T. Hodson, and W. H. Webber, all of whom are large shareholders, and the latter manager, of the Nevada Hills mine, at Fairview, Nevada. The properties secured were the holdings of the Pioche Consolidated, Abe Lincoln, and Miller groups, the latter being situated adjacent to the Prince Consolidated, in which enormously rich silver-lead ore has been recently found.

The Mine Owners' Association of Utah has entered a protest against the movement to take off the tariff on lead, and has delegated Clarence E. Allen, mines manager of the United States Smelting, Refining & Mining Co., and C. E. Loose, manager of the Sioux Consolidated Mining Co., to represent the interests of Utah mine and smelter owners before the Ways and Means Committee of the House of Representatives at Washington.

The building of a railroad into the Yerington, Nevada, district appears to be an assured fact. William H. Bancroft, vice president and general manager of the Oregon Short Line, under whose jurisdiction the building of this piece of road will come, has gone on record as saying that the matter has been settled, in so far as the advisability of entering

Map of Utah.

the camp is concerned. There are certain things to be done yet by the mining companies, but these are only matters of detail. Engineers of the Harriman system some weeks ago reported that the camp has the tonnage necessary to justify the expense of a new road; that the Nevada Douglas alone would warrant the investment, regardless of what has been accomplished in other properties, which are regarded as being nowise unimportant.

The quarterly report of the Utah Copper Co., covering the operations of that company during the months of July, August, and September, has been released, and shows the net earnings during the period to have been $496,656, while the income from other sources amounted to $4735, making the total receipts $501,391. The gross production of copper was 12,000,925 lb., an increase of not quite 450,000 lb., as compared to the previous quarter, the average cost of which was 8.73c. per lb. Stripping operations continued throughout the quarter, at the rate of approximately 87,000 yd. of capping per month, which was equivalent to the stripping of 0.8 of an acre per month. During the quarter the underground ore sent to the mills amounted to 32%, and the steam-shovel ore 68%, of the total.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Gold melts at 2192° F., and silver at 1832.

Crocoite is associated with gold in the quartz of the Niznhi Tagilsk, in the Urals.

Volcanic vents on the surface of the earth at the present time number about three hundred and fifty.

'Poppet heads' is the English and Australian equivalent for the Western 'gallows frame'; for all of these the term head-frame should be used.

Trachyte is from the Greek word meaning rough. The rock usually has an uneven fracture, due to the angular sanidine and the porosity of the groundmass.

Krennerite is a telluride of gold, approximating calaverite as regards composition, but differing from the latter in possessing a perfect cleavage. It is named after J. A. Krenner, of Budapest.

Conversion of centimetres to inches, and vice versa, may be readily accomplished by use of the ratio: Inches : centimetres :: 160 : 63.

$$\text{One inch} = 2.5399541 \text{ cm., and } \frac{160}{63} = 2.53968.$$

The Severn tunnel, which carries the Great Western railway, of England, under the estuary of the Severn river, is not quite 4⅓ miles long. It penetrates strata of conglomerate, limestone, carboniferous beds, marl, gravel, and sand, at a minimum depth of 44 ft. below the deepest portion of the estuary bed.

Phyllite is a name applied to thinly laminated slaty rocks containing mica, usually of the kind known as sericite. They may have resulted from extreme metamorphism of aluminous sedimentary rocks, but excessive shearing under great pressure will also convert many crystalline rocks, such as felsites, into phyllite. In the process of metamorphism the feldspars are altered into mica.

The horse-power of falling water may be estimated by the following formula, which assumes an efficiency of 80% for the wheel:

$$hp = \frac{hq}{11}$$

in which h is the effective head, in feet, and q is quantity of water, in cubic feet, per second.

Accretions in blast-furnace smelting of copper ores are greatly augmented by irregular distribution of the charge in feeding. In fact, accretions are often directly produced by such irregularity. A furnace cannot be properly fed by pouring the charge down a chute, nor can distribution be effected by dropping the feed from a hopper. A device that will pour the mixed charge from a car as wide as the furnace-mouth itself, discharging the burden uniformly as it traverses the furnace top, will overcome the formation of accretions to a large extent, and will sometimes prevent them altogether.

Cyanide of sodium appears to be as energetic a solvent for gold as the potassium salt. Differences in efficiency have often been reported, but the result of prolonged practical experience all over the world indicates that either salt may be used without causing decrease in extraction. Cyanide solutions are inert toward the compounds of the less common metals which are usually found in ores.

Portland, as a name for cement, was first used by Joseph Aspdin, who, in 1824, took out an English patent for a product made by the calcination of a mixture of limestone and clay. It was so called because of the fancied (and in reality very slight) resemblance between the cement and the famous oolitic limestone quarried for building purposes at Portland, England, and known to all English architects and engineers as 'Portland stone'.

Oxidation of the metallic content of minerals during crushing has long been recognized. Sulphides are oxidized to sulphates, and it was pointed out by Manzelius, of the Swedish Geological Survey, that the ferrous iron in minerals is oxidized to the ferric form under the same conditions. Recent tests to confirm or disprove this have shown an increase during fine grinding of ores of as much as 22% in the relative amount of ferric iron present.

Mica varies widely and spasmodically in price, owing partly to the erratic character of the deposits. The mica market is liable to sudden gorging and to equally sudden depletion. To a large extent it is now under control of the General Electric Co., which has been said to own mines capable of supplying all its needs. In 1907 the average prices realized at points of delivery on the Atlantic Coast were $14 per ton on scrap mica and 33c. per lb. on sheet. The price of sheet mica varies according to size, ranging from 25c. per lb. for material cutting 1 by 3 in., to $1.50 when as large as 5 by 8. Freedom from blisters, checks, and stains is imperative for mica to be marketed in sheet form.

Lime-burning today is not generally done by feeding alternate layers of limestone and wood. Exterior fire-boxes, in which the fuel is burned, are placed a few feet above the discharge-hopper of the kiln. The 'mixed-feed' type of kiln, however, is cheaper to construct, and is somewhat more economical of fuel. The product, on the other hand, is less uniformly burned, is apt to be discolored, and it contains the ashes and clinker of the fuel. A kiln 6 ft. diam. at top and 7 ft. at bottom, 28 ft. high, will have an output of about 7 tons of quicklime per 24 hr. The burned lime produced per cord of wood will vary widely with the kind and dryness of the fuel. Perhaps three tons of lime to one cord of pine wood may be taken as a realizable output.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

National Bureau of Mines.

The Editor:

Sir—I wish to call the attention of your readers to certain phases of the proposed legislation establishing a National Bureau of Mines. It will be recalled that an act establishing such a bureau in the Department of the Interior passed the House of Representatives last May, was favorably reported by the Senate Committee on Mines and Mining, and is now on the Senate calendar. As finally worked out, the bill provides for a strictly technical bureau charged with the study of problems related to mining with a view to fostering, promoting, and developing the mining industries of the United States. It is to have no police powers, no duties of inspection, and no special responsibility regarding the mineral lands of the public domain. It is designed to do for the processes of mining and metallurgy what the Geological Survey is doing for mining geology and ore deposits; being co-ordinate with the older organization and taking up the work where the latter leaves off.

It is believed that the Senate will promptly pass this bill and the Bureau will be established. The act carries no appropriation, though, as amended, the technologic branch of the Geological Survey, with the existing appropriations for investigation of fuels and of structural materials, is transferred to the new Bureau. The extension of the work is wholly in the hands of Congress, and is to be determined from year to year by appropriations.

It is a curious and interesting fact that, whereas the demand for a bureau or 'Department of Mines' arose first in the West, and the main credit for its achievement, if the present move be successful, must go to the American Mining Congress, the miners of the Eastern and Middle States seem likely to first get the benefits. The only work now provided for is that on structural materials and on fuels heretofore carried on by the Survey. While these are of National importance, the main interest in them is not in the West, but the East. Benefits to the West must come from the study of its own mining and metallurgical problems. That there are such problems, and that careful scientific study of them will be of great assitance, is not doubted by anyone familiar with the field. In the MINING AND SCIENTIFIC PRESS of August 20, W. A. Caldecott lists a considerable number of problems relating to so well established a process as cyanidation that demand even now scientific investigation if that process is to be improved and its application extended. In the number of August 29 Bertram Hunt says: "Little progress has been made in the development of the technical application of the cyanide process compared to the mechanical improvement. Most cyanide chemists and managers have little leisure and few appliances for research work." This truly reflects the present conditions, and yet our practising engineers must have a basis upon which to build. The need of fundamental research probably has been felt by every engineer who has faced a difficult problem in ore treatment.

In mechanical concentration the condition is perhaps even worse. In the judgment of some of our most thoughtful and most successful metallurgical engineers, mechanical concentration is now as perfect as it can be made with our present knowledge. The mechanical engineer has caught up with the chemist and physicist, and is demanding more data on which to build; and yet our treatment is far from satisfactory. It is common to over-estimate the saving made in concentrating mills because the latter are hardly ever equipped with adequate sampling devices. At Butte, Montana, where sampling is complete and accurate, it is stated that approximately 90% of the ore goes to the mills, and that of this 76% is saved. There is some additional saving from 'slums' sent to the blast-furnace, but this is not always feasible. At Garfield, Utah, where the sampling, while not so complete, is still unusually carefully done, the mill-saving is approximately 70%. In Clear Creek, Colorado, the writer can state, on the basis of a number of runs—with sampling of headings checked against smelter receipts, instead of the usual tailing assays—that the ordinary saving is between 50 and 60%, and occasionally it runs down to 30%. Rarely, and under only most favorable conditions, does it go up to 90%. In the lead and zinc districts of the Mississippi Valley there are no accurate means of determining the saving made, but the best authorities put it, in moderately good practice, at about 70%. It is probably safe to say that of all the sulphides milled in the United States there is an annual loss of 25 to 33%. The value of this in dollars and cents, in even individual properties, is enormous. The manager of one of our copper companies, not the largest, estimates that the copper in his tailing, at present prices, has a value of approximately $5000 per day.

No one is so foolish as to think that all this can be saved, and yet no one should doubt that careful studies will point the way to a saving of some of it. It should further be remembered that each per cent of added saving not only affords a profit, but makes possible the opening and working of additional mines. The West has a very direct interest in any movement to improve these and similar conditions, and I suggest a full and frank discussion of Western needs, followed by a united effort to obtain from Congress such help in meeting them as the conditions of the public purse will allow. If the Mining Bureau is established, it certainly should be instructed to take up certain of the specific problems of the Western States and should be provided with the means for doing so. Doubtless the officers of the American Mining Congress will take the lead in this, as in the previous efforts for legislation. They will need support, but first of all they will need advice from the technical men of the West as to what problems are most pressing.

For the purpose of starting such a discussion, I

venture to suggest the following problems as proper for such a Bureau to take up:

1. Systematic investigations of underground methods of work, carried on from camp to camp, with a view to the formulation of the exact conditions under which each method is applicable.

2. Similar investigations of the methods of haulage, hoisting, drainage, ventilation, and other mechanical engineering problems related to mining, and the publication of appropriate reports.

3. A study of the fundamental chemistry of the cyanide and other leaching processes.

4. A study of the physics of the magnetic, electrostatic, and various flotation processes, with a view to the discovery of underlying principles and of constants necessary to their wider application.

5. A study of the methods of oxidation, with a view to developing, if possible, a leaching process for refractory ores without roasting. In the Black Hills the saving on the 'blue ores,' when treated without roasting, amounts to 35%. Because of its high cost, roasting preliminary to cyanide treatment is locally out of the question.

6. Experiment on wet concentration, directed especially toward the settling and recovery of slime.

7. Investigation of the character, strength, deterioration, and evenness of grade of the powders used in the metal mines, together with the analysis of the gases resulting from their use. This might be supplemented by the formulation of simple directions regarding storage, handling, and use of these powders, discussions of powder-gas poisoning and the proper methods of resuscitation, and similar topics. Leaflets should be printed and placed in the hands of as many miners as possible, with a view to saving life and preventing accidents. The rapid expansion of the industry brings in annually so many untrained men that a campaign of education of this sort is much needed. It is to be remembered that in this country we have no schools for miners—only for mining engineers—and that at the same time there is in mining no regular system of apprenticing.

8. Investigation, in co-operation with the Forest Service, of the problem of timber supply and timber preservation in the mines. In some Western mines the timber bill amounts to half the cost of mining.

9. Study of the effect of mining on the pollution of the streams, with a view to presenting the fair claims of the mining industry in anti-débris and anti-pollution agitations.

It would probably be unwise to take up all these investigations at once, as it would be difficult or impossible to find suitable men for undertaking them, but the list will indicate something of the range of problems to be met. To handle this work properly a carefully chosen corps of men must be brought together, and there will be many difficult problems of organization. It would be foreign, however, to the spirit of the West, to submit to difficulties without trial, and for myself, I am convinced that united and long-continued effort will accomplish much along each of the lines indicated.

H. Foster Bain.

Urbana, Illinois, November 2.

A New Reducer in Fire Assaying.

The Editor:

Sir—In your issue of October 3 appeared an article, 'A New Reducer in Fire Assaying', by E. A. Rose. In view of the fact that your journal and others have considered it worthy of reproduction, I think that statements therein should not be allowed to pass without comment. It is scarcely correct to call iron sulphide a new reducing agent, when we have Fe_nS_{n+1} and FeS occurring naturally in ores. Also, the reducing action of FeS has previously been determined. See 'The Reduction of Lead from Litharge', *Trans.* A. I. M. E., Vol. XXXIV, p. 395. That the proposal to use iron sulphide in place of a carbonaceous reducing agent is new, is not questioned, for the presence of sulphur in an assay is more objectionable than desirable. The article fails to observe the facts that considerably more gas is evolved from decomposition of the alkali carbonates than from oxidation of carbonaceous reducing agents, and that sulphur may be oxidized to SO_2 or SO_3. In the oxidation to SO_2, which escapes as a gas, no reduction in boiling takes place, while to oxidize sulphur to SO_3 requires a basic charge high in litharge, which gives a non-viscous slag, which has as much to do with the decreased boiling and time of fusion as the use of a reducing agent producing no gas. The charge given, using pure silica for ore, and substituting argol for FeS was fused in a 15-gm. crucible without boiling over, which, according to statement should have given trouble in a 20-gm. crucible. The effect of this character of charge on boiling in assaying sulphide ores, was noted in the above mentioned article, in the *Transactions*, on page 397. Just how from 15 to 20 minutes is to be saved in time of fusion is a question, as 25 minutes is ample time for ordinary acid ore charges, and to make a fusion at any reasonable assay-temperature in five to ten minutes is preposterous. In what way this reducing agent is to appeal to those who have sulphide ores to assay by the nitre method, where no reducing agent is required, is an enigma.

To sum up: In order to make use of a new reducing agent, which, in itself, slightly decreases the boiling and time of fusion, Mr. Rose has found it necessary on account of the properties of this reducing agent, to devise a charge excessive in flux, particularly PbO, which in itself is expensive, and also on account of its rapid destruction of crucibles. This high PbO will also give questionable silver results. The advantages are so far outweighed by the disadvantages that they cannot be considered.

E. J. Hall.

New York, October 30.

Drill-Steel.

The Editor:

Sir—Through your paper I wish to suggest to the manufacturers of drill-steel for piston-drills, that the cruciform or ribbed steel be made with a slight twist, say about one quarter turn in 8 ft. of drill-rod. As the piston rotates in the backward stroke, the twist would have a tendency to draw the cuttings from the hole, and by cleaning the hole better there will

be less resistance to overcome than when using straight ribbed steel, or any other kind of steel commonly used.

R. NOBLETT.

Treadwell, Alaska, November 11.

Chlorination in California.

The Editor:

Sir—In replying to Mr. W. J. Adams' comments on my article published in the MINING AND SCIENTIFIC PRESS of October 31, I will say that I spent several months last summer in visiting and inspecting some of the large metallurgical plants in Colorado, and made a special study of the various types of mechanical furnaces in use for desulphurizing ores; but did not see any that completely filled all of the requirements for a chloridizing furnace. I believe, however, that a combination of some of the types could be formed that would ensure uniformly good results, and avoid the fusing action so common in both the hand-reverberatories and the mechanical furnaces now in use.

The conditions governing a good chloridizing roast are as follows: the dried and pulverized ore should be ignited as soon as possible after being charged, to hasten the operation and to give the furnace a maximum roasting capacity. After the ore has been thoroughly ignited it should be rabbled frequently to ensure uniform burning, and a sufficient quantity of air should be allowed to pass over the burning ore to not only supply oxygen for the reactions and to remove the spent gases, but also to carry off a part of the excess heat and allow the ore to roast slowly without generating sufficient heat to produce sintering. After the first atom of sulphur has been removed and the sulphates commence to break up, the ore loses heat rapidly and should be advanced toward the firebox, and a sufficient quantity of external heat supplied to maintain the ore at a cherry red color until the greater part of the sulphates have been decomposed and the combined base metals oxidized.

A little salt will now assist in decomposing some of the more refractory sulphates, by forming volatile chlorides of the base metals and allowing the remaining atom of sulphur to either unite with the sodium or to pass off as sulphuric anhydride. But if the temperature should be too high, some of the gold will also be chloridized and will commence to escape as a volatile chloride. For this reason I believe that the salt should be added after the heated ore has been discharged from the furnace, and I would advise the use of a rotating cylinder having the receiving end brick-lined and the discharge end water-jacketed, so that the chloridized ore would be discharged in a cooled condition for subsequent treatment. As there would probably be some volatilization of gold even under the most favorable conditions, I would advise exhausting the fume from this chloridizing cylinder and forcing them through a scrubbing tower, to absorb and recover any gold that might be volatilized. If, however, one of the Crosby furnaces that Mr. Adams describes can be depended upon to roast ore so as to yield 99% recovery of the gold, there is little more to be desired. I have obtained an extraction of 98.5% on a small sample of ore roasted in the assay-muffle, when roasting without salt, but in actual practice, working on a large scale, I have never been able to bring a month's run up to over 96% bar-recovery of the purchase price of the ore, and I have so often obtained much less than that percentage that I felt like 'patting myself on the back' whenever I was able to make so good an extraction.

WILTON E. DARROW.

Sutter Creek, California, November 23.

State Mining Bureau.

The Editor:

Sir—I have had called to my attention an editorial which was published in your journal under date of November 21, 1908, and which is headed 'State Mining Bureau'. This editorial relates to an article on gold dredging, published in the *Pacific Miner*, and regarding same, I wish to say I did not supply the article, nor did I claim the credit for it. Upon learning that the article had appeared in the *Pacific Miner*, on November 13 I wrote to the editor of that journal asking that a correction be made in the next issue, which will probably be done.

Regarding the articles which are appearing from time to time in the MINING AND SCIENTIFIC PRESS, I wish to say that if you would take the pains to correctly inform yourself of facts before going off half-cocked in your attacks not only on the State Mining Bureau, but upon myself, I believe it would redound more to the credit of the journal which you represent. The statements made not only do a great injustice to the State Mining Bureau, but are deliberate attempts, resulting from personal animus, to discredit work which has the support of every legitimate miner in this State. I use the word "legitimate" advisedly. I do not refer to the political miners nor sharks who attach themselves to the mining industry, and who have been defended by you in many instances.

If you had one spark of fairness in your composition, you would honestly investigate before adopting the mud-slinging tactics you have pursued. You have printed a mass of lies, and I have proven to you that you lied. An honest journalist, when confronted with facts showing he had made misstatements, would endeavor to correct such mistakes, but not so with you.

However, when the reasons, political and otherwise, are considered, which inspire these attacks, and of which reasons I am well aware, it is needless to expect that the MINING AND SCIENTIFIC PRESS, under your administration, would adopt the system of fairness for which it was once noted.

L. E. AUBURY.

San Francisco, November 21.

[Mr. Aubury's letter arrived last week, after this department of the paper had gone to press. His letter speaks for itself. It answers nothing, but it saddles the responsibility for the dredging article on the editor of the *Miner*. This we anticipated, as will be seen by referring to the criticism appearing in our

issue of November 21. Fortunately, the readers of this journal need no statement from us that we try to be fair and truthful, nor the assurance that we have no concern with politics, save as it affects citizenship in a broad way. Mr. Aubury has not proved, nor can he prove, that our criticism of the Bureau and of his management, are not justified. Upon the only occasion when we held a conversation with him, he made a number of statements that we ascertained afterward to be grossly false. At that time we were misled by an appearance of candor. The Trustees know that the statements made in this paper are true and prompted by a proper spirit. It is time for them to take action.—EDITOR.]

Alternating Exhaust and Pressure Ventilation.

The Editor:

Sir—A note in your last issue, referring to a practice in certain Victorian mines, suggests the following method of controlling the outflow of gases in coal mines, always troublesome, often disastrous.

With a well designed system of ventilation the air current can be easily and quickly reversed. I would suggest that while men are in the mine the fan be run to force air in, and at all other times in the opposite direction. To intensify the 'exhausting' effect the intake might be throttled. Of course, the change in pressure thus produced could have little, if any, effect on gases held in the solid coal, but it seems to me it would greatly reduce the amount retained in crevices in the coal and in open places in the mine, and thus relieve the situation during the danger period.

This plan is, of course, inapplicable to mines that never rest, but, from the difficulty people in Nevada experience in getting coal, I am disposed to think there are at least some that do not work the whole twenty-four hours.

W. F. COLLINS.

Battle Mountain, Nevada, November 23.

Deep Lead Mining in Australia.

The Editor:

Sir—In a very interesting article on this subject appearing in your issue of October 24, the author, Mr. D. H. Browne, stated in conclusion that "deep lead mining had been somewhat under a cloud for several years, but this is due principally to the great cost entailed in pumping out the heavy flow of water, and not because the gold contents of the lead is inferior."

In the case of the recently deceased Lodden Valley Co. the low grade of the gravel encountered, together with its spotted character, are given as the causes of its failure. It is true that the heavy running expenses due to pumping cost in this mine increased the total working cost, but it cannot be denied that the nature and the value of the gold contents of the gravel found were most disappointing. Messrs. Bewick, Moreing & Co., the general managers, in their final report, made the following statement:

"The general results have been on the whole disappointing and discouraging. The wash has unfortunately proved to be spotty and the gold contents very unevenly distributed. Indeed, so evident has been this tendency that it has been found unsafe to place too great reliance on prospects obtained from even the cutting-up drives. Later paneling of areas thus tested has given results much lower than the average called for by the trial washes. While it is true that the territory tested by the underground workings represents but a fraction of the total area of your holdings, yet the spotted nature of the wash, together with the fact that no encouraging ground has been opened up during last year's work, make it, in our opinion, inadvisable to expend any further money on the property."

Mr. C. Algernon Moreing, in his speech to the shareholders of this company, further emphasizes this point of low values and spotted character, and "personally did not feel inclined to go any further, or advise anybody else to go any further."

London, November 10. NEWTON B. KNOX.

Information Wanted.

The Editor:

Sir—I am anxious to obtain some information about hand and power-drills, either of the churn or rotary type, for boring holes of 3 in. diam. and over for blasting purposes only—say, in quarry work. Are they largely used anywhere? If so, where? Will they do the work economically and save 'springing' holes. If so, at what rate of speed per hour of boring, and at what cost per foot or metre of hole in different classes of rock. Will they do efficient work to a depth of 60 ft., or in the case of hand-machine to, say, 25 ft.? I am flooded with catalogues and makers' letters, but should like some notes and records of practical experience by disinterested users. Statements of charges used in blasting such holes would be of great practical interest too.

Spain, October 28. HALIFAX.

[We hope one or more of our readers will contribute information based upon their own experience.—EDITOR.]

Crosby Furnace.

The Editor:

Sir—In today's MINING AND SCIENTIFIC PRESS I notice an article by W. J. Adams, in which he describes a furnace called the Crosby. To some of us older ones it comes like an echo from the long ago. The Crosby furnace came down from 1868, when the Crosby-Thompson process created a good deal of sensation in Colorado, where all kinds of processes were in vogue. The furnace was the only good thing in it, and it did really good work. Mr. Adams gave me the first information I have had that it was ever used outside of Boulder county, Colorado, where a great many processes were born and died. It was developed by the late Lawrence Thompson, of Boulder, and to my own knowledge did excellent work. I have often wondered why it never came into use, as it is cheap and efficient. The patent on it long ago expired.

W. C. WYNKOOP.

San Francisco, November 21.

RESEARCHES IN DIAMOND MAKING.

Written for the MINING AND SCIENTIFIC PRESS
By F. H. MASON.

The art of alchemy was started with the avowed intention of discovering the philosopher's stone and the elixir of life, and with these rewards in view as a fillip to the early philosophers, they persevered in their researches, and ultimately founded the science of modern chemistry. While neither the philosopher's stone nor the elixir of life has been discovered, the science of chemistry has yielded rewards to its devotees, and today offers a large field for profitable research.

There is one branch of chemistry in which apparatus necessary for research is costly and easily frangible, and for which ample financial resources are essential. It is doubtful if even the more fortunate members of the profession would devote themselves to this branch were it not for the fact that there is a fillip behind it, as there was behind the old art of alchemy. I refer to the study of chemistry under very high temperatures and enormous pressures. Behind this research is the possibility of finding a process for the manufacture of precious stones, in an endeavor to imitate nature's laboratory. I do not wish to infer that the study of the behavior of substances at high temperatures and under excessive pressures is being carried on wholly with this view. What I desire to state is that there is the chance of making a valuable discovery, and that adds zest to the work, as the hope of the philosopher's stone inspired the alchemists of old.

The study of chemistry at high temperatures and under excessive pressures is likely to throw light on many subjects now in darkness. The most recent work on this subject has been done by Richard Threlfall, and he has employed some original apparatus, which apears to be less costly and more efficient than that which has been previously used. Former experimenters have generally employed gases or liquids to communicate the pressure to the substance to be operated upon. Mr. Threlfall conveys his pressure by means of a steel plunger working upon crystalline graphite. Crystalline graphite flows readily at medium pressures, and makes a practically frictionless fluid. The apparatus is simple, and although I referred to it as frangible, it can only be so considered relatively to the excessive temperatures and pressures it has to withstand. It consists of three main parts: (1) Appliance for producing pressure. (2) A vessel capable of withstanding pressure. (3) Apparatus for electric heating. The pressure is applied by an ordinary hydraulic jack capable of lifting 50 tons, and provided with an accurate and sensitive gauge. The electric heating is provided by a 10 to 20-kw. transformer, wound on both sides with several separate windings, which can be connected so as to suit the requirements of the different experiments. The pressure-vessel (Fig. 1 and 2) consists of two cylinders of steel, AA, BB. Each cylinder is turned and ground to exactly the same external diameter, and the faces which are intended to be in contact are ground so as to fit with almost optical precision. Each cylinder is bored as shown, and after the cylinders are clamped by the carefully turned clamps CC, the whole is ground to a perfectly cylindrical form. The clamp is insulated from the cylinders by a thin sheet of special packing, and in boring the clamp, allowance is made for this. The two metal cylinders are separated by a sheet of mica about 0.5 mm. thick. The sharp edges of the hole are chamfered. The cylinders are held together by means of the cross-pieces DD, EE, and the bolts FF, made of mild steel. The plug H is of hardened tool-steel, and when screwed up the head fits snugly in the recess in E, so that the pressure when applied is not borne by the threads.

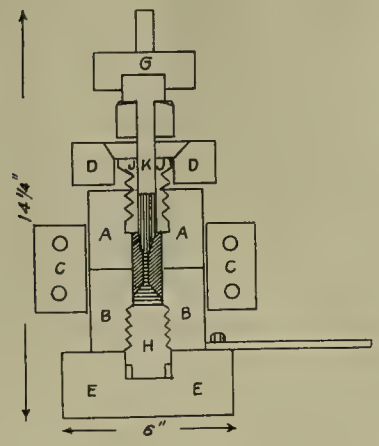


Fig. 1.

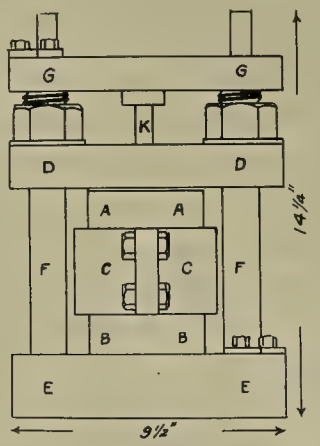


Fig. 2.

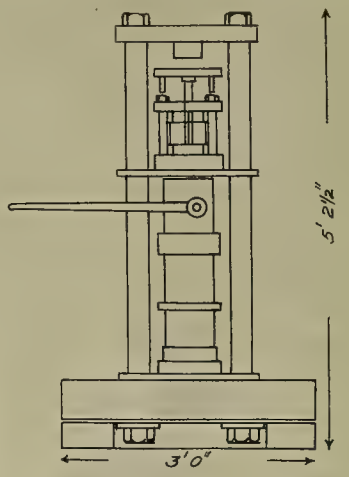


Fig. 3.

The upper cylinder is provided with a plug of hardened tool-steel, J, with the end accurately ground to fit the recess. The ram K is made of hardened tool-steel, and fits at the top against a piece of hardened tool-steel let into the insulated bar G. This insures the application of the pressure to the ram in the direction of its length. The pressure-vessel is insulated from the upper clamping bar by means of a sheet of mica between A and D. The electric current to produce the heat enters the apparatus by the

bar K and leaves by a connection to the plate E. As the two cylinders are insulated from each other and from the clamp C, the full potential of the current is thrown on the mica plates between A and B, and, if suitable arrangements are made, must pass through the substance under experiment in the pressure-vessel. Purified magnesia has been found to be the best substance with which to line the pressure-vessel. Magnesia is not easily compressed. It was found in this apparatus that a pressure of 50 tons per square inch only compressed the magnesia about 3 mm. below the ram. Therefore in lining the pressure-vessel only 2 to 3 mm. could be compressed at one time, and the cylinder had to be filled gradually.

When the hole in the cylinders is filled with magnesia, the cylinders are placed in a lathe and a hole bored through the magnesia, 3 to 4 mm. diam., and deeply chamfered at both ends. The magnesia tube is then rammed full of graphite, and the graphite continued half way up the plug J, to form a reservoir to draw upon as required. Finally the ram is inserted and the graphite pressed with more than the full pressure it is intended to use. A current of 500 to 600 amperes is then passed through the graphite. Almost immediately the pressure-gauge begins to fall, owing to the melting of the magnesia, for, however hard it be packed, it will be found to make room for graphite when it melts. The current is kept on for five or six seconds, the pump being worked vigorously all the time to keep up the pressure. The apparatus is allowed to cool, the ram is taken out, and the graphite scraped out. The tube of fused magnesia is then ready to receive any mixture it may be desired to experiment upon. Should the mixture be a non-conductor, a wire or rod must be inserted as a heater. Mr. Threlfall appears to have confined his attention principally to the study of carbon. Small electric-light carbons were subjected to pressures of from 50 to 117 tons per square inch, and to temperatures calculated to be in the neighborhood of 8000° C. The rods were converted entirely into graphite; as viewed under the microscope, the original granular appearance was completely lost.

Graphite in its natural state, artificial graphite, and Ceylon graphite purified by fusion with caustic potash, washing, and then digesting, first in hydrofluoric and hydrochloric, and afterward in hydrofluoric and sulphuric acids, and thoroughly washing, were all experimented upon at temperatures between 7000 and 8000° C., at pressures varying from 50 to 100 tons per square inch. The most thorough search was made at the end of each experiment, but in no instance was the smallest specimen of diamond found. The graphite in some experiments was converted into large brilliant crystals; sometimes it showed increased density, and sometimes diminished density. The pressure was always maintained while the apparatus was cooling, in order that the crystallization should take place under pressure.

One experiment was made with a mixture of silicon carbide and iron filings, with the expectation that the silicon would leave the carbon and join the iron,

$$SiC + Fe = FeSi + C,$$

and that the nascent carbon might crystallize in the form of diamond; but the iron appeared to have melted and been forced into the magnesia tube before the temperature of the reaction was reached.

While Mr. Threlfall's experiments have up to date been negative, so far as concerns the making of diamonds, the results are of considerable interest. The weak part in the apparatus appears to be that a high temperature cannot be maintained for any length of time: the longest recorded experiment was one in which the current was maintained for ten seconds. In this case the magnesia lining was completely melted and the carbon concentrated in the centre. If it were possible to materially increase the thickness of the magnesia lining, the substance under examination might be kept at a high temperature for a considerable period. The ideal conditions, as Mr. Threlfall points out, would appear to be the heating of carbon to a high temperature for a short period with some substance in which it is soluble, and then to maintain it at a temperature at which the carbon would begin to separate for a long period, and to keep it under high pressure during the whole time. In this way it might be hoped to build up crystals of large size, and should the carbon crystallize in the form of diamond, the product might be of some commercial value, and not a mere chemical curiosity.

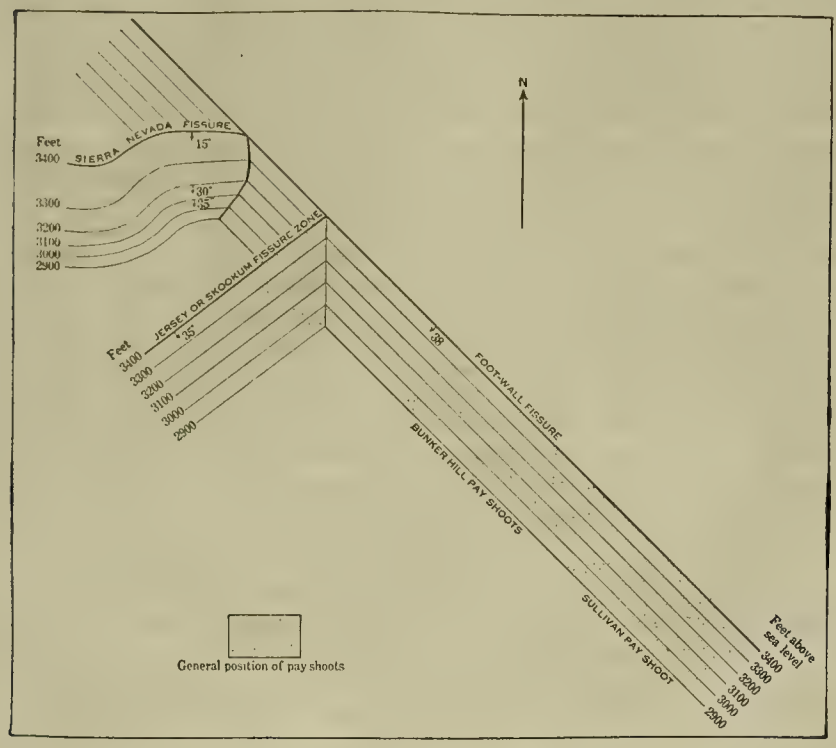
Iron and silver have been usually employed as solvents for carbon in attempts to make diamonds. Henri Moissan in his successful attempts used iron. While of course iron is present in the matrix in which diamonds are found in Nature, it is practically demonstrable that they have not crystallized in metallic iron, and that the latter has then been oxidized away. It is possible that carbon may be soluble in substances at high temperatures, and under excessive pressures in which it is not soluble at lower temperatures and without pressure. This seems a hopeful line for research.

Condensation of smelter fume by a process of refrigeration has been proposed by Franklin R. Carpenter. This would necessitate cooling the fume to —10° C., at which point the SO_2 would be liquefied. The heat of the furnace gases would be used to do the work of refrigeration, after the manner of ice-machines of the absorption type. As an over-production of sulphuric acid at places where the demand was inadequate would result from this process in the case of most smelting plants, Mr. Carpenter proposes further to utilize a reducing atmosphere by which the SO_2 would be reduced to solid sulphur, which could be separated by passing the fume through bags, as is now done at many smelters to save the solids carried from the furnaces with the gases.

A portable eating station is in service on the Wyoming lines of the Chicago & Northwestern railroad. A change in schedule made the station at Douglas no longer convenient, and so a restaurant, composed of four cars, was substituted, that could be moved from place to place as occasion might require. The four cars comprise a dining room, kitchen, lunch room, and bunk car for the crew.

THE OREBODIES OF THE BUNKER HILL & SULLIVAN MINE.

*All of the ore of the Bunker Hill & Sullivan, Last Chance, and Sierra Nevada mines lies in fine-grained sericitic quartzites thought to belong to the Revett formation. The orebodies are definitely related to a persistent fissure which strikes N. 45° W. and dips to the southwest at an average angle of 38°. Both dip and strike, however, show local variation. This fracture, locally known as the "foot-wall fissure," is in this report called the Bunker Hill fissure. It has been traced almost continuously from the Sullivan claim, on the east side of Milo creek, to a point about 200 ft. down the west slope of the ridge between Wardner and Deadwood gulch. Southeast and northwest of these respective limits, the Bunker Hill fissure is not definitely known. By some it is thought to be identical with the Sierra Nevada lode; by others to pass through the Senator Stewart, Silver King, and Crown Point claims.



Stereogram showing the general relations of the principal fissures and pay-shoots of the Wardner group of mines, within a vertical range of 500 ft. The observer is supposed to be looking vertically down the lodes, which are represented as opaque sheets ruled with contour lines 100 ft. apart. The general positions of the pay-shoots are indicated by stippling.

The fissure has all the characteristics of a considerable fault; but the two walls are lithologically identical, and whatever faulting has taken place has not perceptibly affected the structural relations of the rocks at the surface. The amount of the displacement along the Bunker Hill fissure, and its character, whether normal or reverse, are unknown. By reference to the geological map, it may be seen that the Bunker Hill fissure lies on the south side of the great Osburn fault, which has been traced by Mr. Calkins from the vicinity of Mullan to the western edge of the area mapped. This is a normal fault with southerly dip. Its course is from N. 75° to 80° W., and it is thus plain that the Bunker Hill fissure and the Osburn fault must come together to the west if each holds its course. It is probable that the Bunker Hill fissure, if indeed it crosses Deadwood gulch, concerning which there is doubt,† meets the Osburn fault between Deadwood and Government gulches, somewhere near the Senator Stewart mine, and there terminates. At least it is not likely that the Bunker Hill fissure will ever be recognized in the Prichard slates on the north side of the Osburn fault. The Kellogg tunnel, which affords the longest and best cross-section of the foot-wall country, cuts through the Osburn fault, although as this part of the tunnel is entirely in Burke quartzite which is fissured and disturbed at many places, the exact point at which the fault and tunnel intersect is not precisely determinable. It is probably, however, near the first bend in the tunnel, about 4000 ft. from the portal. The Kellogg adit reaches into the quartzite which has been mapped as 'Burke', although surface exposures are unsatisfactory and the structural relation of these quartzite beds to the Prichard slates to the west, north, and east of them are by no means well determined. For the first 3000 ft. from the portal the beds show much variation in strike and dip. In general, however, they strike northwest and dip northeast at an angle of 65°. The beds are in many places sharply flexed and are traversed by numerous fissures which are usually filled with a gouge of crushed quartzite. At a distance estimated at 1500 ft. from the portal the tunnel cuts a band of dark slate, possibly 50 ft. wide, such as is characteristic of the lower part of the Burke where it grades naturally into the Prichard formation. The presence of this slate suggests that in spite of irregularities of dip the quartzite near the mouth of the tunnel belongs near the base of the Burke formation and rests in a generally normal position upon the Prichard.

Near the first bend in the tunnel, or about 4000 ft. from the portal, the quartzite is so badly broken for

*Abstract from Professional Paper 62, 'The Geology and Ore Deposits of the Coeur d'Alene District, Idaho.' By F. L. Ransome and F. C. Calkins, U. S. Geological Survey.

†See Finlay, J. R., 'The Mining Industry in the Coeur d'Alenes, Idaho', *Trans.* Am. Inst. Min. Eng., Vol. XXXIII, 1903, p. 271, note.

a distance of several hundred feet that the tunnel required lagging. The Osburn fault probably coincides with this disturbed ground. South of it the beds have a more nearly east-west strike, ranging from N. 50° W. to west, and a general southerly dip of 50° to 80°. These seem to be the prevalent directions of strike and dip of the beds throughout the mines. Near the orebodies, however, the bedding planes are in many places obscured by sheeting or shattering of the quartzite. Ripple marks serve to distinguish bedding from sheeting, but these are not invariably present. The boundary between the Burke and Revett formations was not recognized in this tunnel.

So far as ore deposition is concerned, the Revett quartzite found in the Bunker Hill & Sullivan and Last Chance mines may be regarded as homogeneous material. The formation of the orebodies appears to have been conditioned by fissuring and the disposition of the ores exhibits no observable relation to bedding planes, nor is there anything to suggest that, within the general zone of mineralization, particular beds have been more favorable than others to the accumulation of ore. Details of folding may thus be eliminated from economic consideration.

The only eruptive rock known in the Bunker Hill & Sullivan and Last Chance mines is a much altered greenstone dike which is exposed at the halfway switch in the Kellogg tunnel. The dike is about 50 ft. wide and may have been a diabase or diorite. It is now full of secondary quartz, chlorite, carbonates, serpentine, green amphibole, and other alteration products. The dike is far in the foot-wall country and apparently has no connection with the orebodies, which are found only in the quartzite of the hanging wall. A similar dike is exposed in the Black Hawk tunnel.

The Bunker Hill fissure is well defined throughout the productive parts of the Bunker Hill & Sullivan and Last Chance mines, and is usually recognized with ease by its characteristic appearance. There is almost invariably a thin seam (1 or 2 in.) of tough, nearly black clay gouge, which usually shows two or more planes of movement and slickensiding. According to Mr. Easton, this gouge contains lead and manganese. Under this seam is a white, creamy, or buff band, ranging from a few inches to a foot or more in thickness, of crushed quartzite which in places is so finely powdered as to form what is usually termed sugar quartz. This white band contrasts strikingly with the black clay seam, and this is very characteristic of the Bunker Hill fissure. The sugar quartz usually passes gradually into the less disturbed foot-wall quartzite. On the hanging-wall side the black seam is in some places in contact with ore, in others with shattered but barren quartzite.

Although the quartzite of the foot-wall has been well explored, all the ore so far found in the Bunker Hill & Sullivan, Last Chance, and Sierra Nevada mines has lain in the hanging wall of the Bunker Hill fissure. That no ore should have been deposited beneath the persistent seam of dark gouge characteristic of this fissure is remarkable, as the quartzites of the foot-wall are identical in character with those of the hanging wall, and are in places extensively fissured and broken, though usually less so than in the hanging wall. In the hanging wall, in addition to much irregular fracturing, two sets of fissures may be distinguished, one approximately parallel to the Bunker Hill fissure and the other nearly at right angles to it.

The zone of fissured quartzite in which the orebodies occur has a maximum width of 300 ft., measured perpendicularly to the Bunker Hill fissure. Within this zone, either in contact with the foot-wall or separated from it by barren quartzite, are numerous irregular orebodies, usually without definite walls or boundaries. Locally, however, the ore may be bounded on one side by the clay gouge of the Bunker Hill fissures or on one or more sides by some of the subsidiary hanging-wall fissures. It is difficult to convey a satisfactory idea of the dimensions of orebodes so lacking in regularity. Individual pay-shoots may be 500 ft. in length, 100 ft. or more in width, and 300 or 400 ft. in depth. The whole fissured zone, 300 ft. in width, may, in a broad sense, be regarded as a single great lode, within which the partly overlapping and partly connected orebodies are not uniformly distributed in the plane of the zone but are grouped into at least four fairly distinct shoots. The most southeasterly of these is the Sullivan ore-shoot, which has been extensively stoped above the Reed level, but which is as yet unexplored below the sixth level of the Bunker Hill & Sullivan mine, although it will probably soon be reached on the ninth level. On the west side of Milo creek, extending from the Richmond tunnel up the hillside to the open-cut just above the Bunker Hill No. 1 tunnel, is the original Bunker Hill ore-shoot, which above the Reed level might perhaps be regarded as two shoots. This is apparently the same great ore-shoot which is now being stoped on the eighth and ninth levels, and in the new tenth and eleventh levels, below the Kellogg tunnel.

Still higher up the slope a third shoot, which may conveniently be designated the Blacksmith ore-shoot, from the name of the first stope, comes to the surface and has been extensively worked down to the sixth level. Below that level very little ore belonging to this shoot has as yet been found.

All three of the foregoing shoots, so far as developed, pitch to the northwest at an angle of approximately 45°. A fourth shoot is cut in the Tyler tunnel, near the crest of the ridge separating Milo creek from Deadwood gulch, and seems near the surface to have a northwest pitch, like the others. This shoot, however, which is the one whence the Last Chance mine has obtained the bulk of its ore, lies in the pitching trough formed by the Bunker Hill fissure and the Jersey or Skookum fissure, and the local norhtwest pitch observable in the Tyler workings is replaced at greater depth by the southwest pitch due to the dip of the Jersey fissure. The general relation of the Tyler, Jersey, or Skookum ore-shoot to the Bunker Hill and Jersey fissures is shown diagrammatically in Fig. 1.

The Jersey fissure, or, more correctly, fissure zone, has an approximately northeast-southwest course,

and thus meets the Bunker Hill fissure nearly at right angles on any given level. It dips to the southeast, apparently at an average angle of 35°; but as it is less regular and has been less continuously explored than the Bunker Hill fissure, the average dip has not been accurately determined. The principal fissure of the Jersey zone resembles in general character the Bunker Hill fissure, and is related in a similar manner to orebodies of irregular shape and distribution lying within its hanging wall. Very little ore in the Last Chance mine has been found along the Bunker Hill fissure except where it is joined by the Jersey fissure zone, which, so far as known, ends at the junction. Under the Jersey fissure zone, and lying approximately parallel to it, is a second fissure zone, known as the Sambo. This is narrower than the Jersey zone and has not been nearly so productive. The relation of the Sierra Nevada vein to the Bunker Hill fissure is a moot question, and is likely to remain so until some exploration is made of the neglected block of ground lying between the Last Chance stopes and the Inez shaft.

The orebodies of the Bunker Hill & Sullivan mine are usually of entirely irregular form, and the longest diameter of the body may lie at any angle with the Bunker Hill fissure. The absence of definite limiting walls to the ore is a characteristic, although not invariable, feature of these large bodies. Masses of nearly solid galena grade outwardly into ore containing larger proportions of gangue, and finally into barren country rock. Here and there, however, the ore ends abruptly at a fissure whose walls show evidence of some movement since a part at least of the galena was deposited. Such a fissure, for example, forms a local hanging wall to part of the large March orebody on the Kellogg level. Similar fissures in some places traverse the orebodies, and the ore forming their walls is usually slickensided. Nowhere, however, are the fissures important faults. Some orebodies rest directly upon the foot-wall of the Bunker Hill fissure and are slickensiding, showing that movement along this fissure has continued since the ore was deposited.

The orebodies of the Last Chance mine, though in many places fully as irregular as in the Bunker Hill & Sullivan, lie chiefly along the Jersey fissure-zone, and many of them are roughly tabular parallel to that zone. The Senator Stewart orebody, as opened in 1904, was about 300 ft. long. It strikes N. 35° E. and dips at a steep angle to the southeast. The ore forms an irregular, elongated, ill-defined mass in much fissured quartzite. It apparently follows a zone of cross-fissuring and may be related to the Bunker Hill fissure much as is the Jersey ore-shoot. The position of the Bunker Hill fissure, however, is as yet undetermined west of the Last Chance mine. The main orebody apparently does not reach the surface, being cut off a short distance above the main tunnel by some gouge-filled fissures with low angles of dip.

In the Silver King mine a few small bunches of ore have been found in the badly shattered quartzite forming the hanging wall of the Osburn fault. The ore is said not to occur at a less distance than 20 or 30 ft. from the slate foot-wall. In the Crown Point mine the ore, which has been mostly stoped out, formed an irregular rolling sheet in the shattered hanging-wall quartzite. In some places it was nearly horizontal, but in general it had a dip of 20° to 30° northeast. It thus dipped toward the southward-dipping Osburn fault, orebody and fault coming together near the main tunnel level in a line of junction which in some parts of the workings is 25 ft. above and in others a few feet below that level. No orebodies of importance have ever been found below this junction. The ore is said to have ended abruptly at the slate foot-wall, and to have shown some slickensiding, probably due to comparatively recent movement along a fault whose major dislocation antedated the period of ore deposition.

The mineralogical character of the Bunker Hill & Sullivan ore is simple, galena and siderite constituting over 90% of the whole. Associated with these minerals are usually small quantities of quartz, sphalerite, and pyrite. Some tetrahedrite and chalcopyrite are reported from the Sullivan stopes and from the Tyler workings. These minerals, however, are not characteristic of the principal orebodies of the Bunker Hill & Sullivan mine—such, for example, as the March stope on the ninth level. The best ore from such stopes consists of rather fine-grained masses of galena with subordinate siderite. This grades into ore in which the siderite exceeds the galena, and this into barren quartzite. The ore is principally a replacement of the Revett quartzite, but the replacement is closely connected with fissuring and some of the galena was deposited in open spaces. A typical mass of ore of moderate richness shows a base of matrix of pale brown siderite traversed by countless reticulating veinlets of galena. In the poorer ore these veinlets are fairly distinct and show only slight metasomatic enlargement of the original cracks. But in the richer ore they coalesce into bunches of solid galena. It is plain that the quartzite was first fissured and replaced by siderite. Subsequently the siderite was shattered and solutions deposited galena in the intersecting fissures and, by metasomatic replacement, in the siderite of their walls. Where the little fissures were particularly numerous and the other conditions for deposition favorable, the siderite has been wholly replaced by galena. But the process was not entirely so simple. Some of the galena is traversed by stringers of siderite and by veinlets of galena of different (usually finer-grained) crystallization from the mass of the ore. Moreover, here and there galena directly replaces the quartzite. It is evident, therefore, that there has been some recurrence of conditions favorable to the deposition of galena and siderite, and probably also of quartz, pyrite, sphalerite, and other metasomatic minerals. In the Bunker Hill stopes quartz and pyrite are usually most conspicuous in the transition zone from ore to country rock.

The ore of the Skookum or Jersey fissure zone, which has afforded the bulk of the output from the Last Chance mine, has certain mineralogical features which usually serve to distinguish it from the typical Bunker Hill ore.

COPPER DEPOSITS OF WHITE HORSE.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

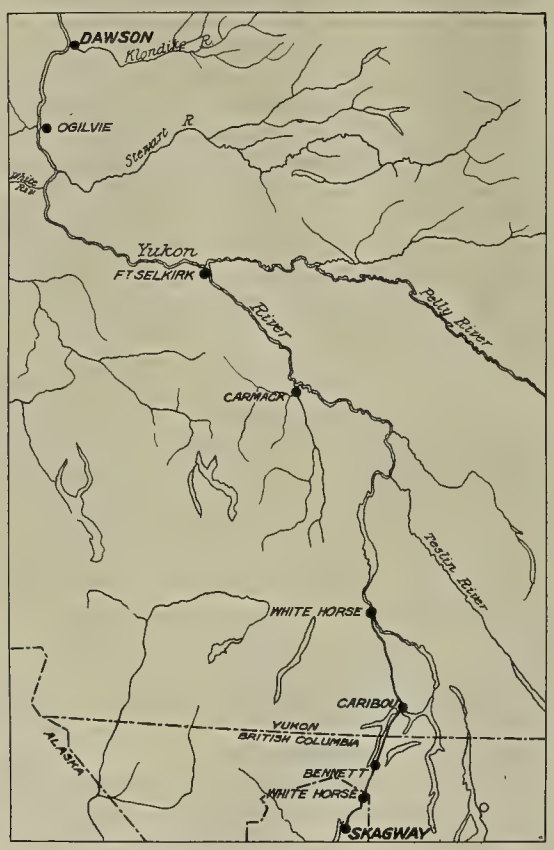
The town of White Horse, on the Yukon river and in the Yukon Territory, is the terminus of the White Pass & Yukon railroad, which is a part of the established route to Dawson. White Horse is 110 miles north of Skagway and 460 miles south of Dawson. At a distance of two or three miles from White Horse there is a belt of copper-bearing country that extends for about 10 miles in a nearly north and south direction. The whole tract has been covered with locations, the activity in this regard being disproportionate to the actual work accomplished in the way of mining. A little real prospecting has been done on four different groups of claims, all of which are readily accessible over the roads constructed by the Government of the Yukon Territory.

Four miles from White Horse, a straggling frontier town, is a large group of claims that was bonded last year by Col. W. S. Thomas, of Guffey & Thomas, Pittsburg. About $80,000 is said to have been spent in preliminary work, and then the ground was abandoned, save for the Copper King claim. A shaft on the neighboring Anaconda claim is 20 ft. deep, with an open-cut. In approaching this prospect the road passes under a bluff of white limestone, suggesting the character of the country rock. In the shaft it is seen that the ore consists of an impregnation of copper in the limestone, the best showing being for a width of 5 to 10 ft. and a length of 100 ft. Bornite is associated with tremolite, garnet, and quartz. There is an intrusion of granite near-by, but the lode is not a contact, although it is obviously the result of contact metamorphism such as has been studied and described so lucidly in Kemp's papers.*

The Pittsburg Colonel is said to have spoiled the market for mining property near White Horse by taking options at absurdly high prices; thus, a claim 1500 ft. square with a 3 to 5% copper lode across it was bonded for $250,000. Such a load would break the back of any boom. The cost of mining in this locality is high, owing to heavy freight charges and expensive labor. I shall speak of this later. Let us proceed to other mines.

The next group of claims is called the War Eagle. Here we (Scott Turner and the writer) saw a nicely arranged dump, with pretty fragments of variegated bornite fringing the foot of the pile of ore that had come from shallow workings. The erubescite was accompanied by chalcopyrite, white tremolite, brown garnet, and calcite, in a silicified limestone. In the wash covering a portion of the surface I saw fragments of hornblende-granite, which occurs close-by. Garnetiferous limestone constitutes the ore-channel. The ore is not compact, but scattered, so as to yield a low-grade product. There is a width of 20 ft. through which the copper mineral is scattered. A shallow adit 100 ft. long connects with a winze 50 ft. deep. In this there is a nice showing of chalcopyrite. The ground is hard, and it breaks short because of the tremolite.

The Copper King was the next mine visited. T. H. Kerruish is superintendent, and by his courtesy we went through the 243 ft. of adit that attains a depth of 80 ft. below the surface. A winze 63 ft. deep exhibits a lode 5 to 8 ft. wide in garnetiferous limestone. The granite is not 100 ft. from the orebody. On the adjoining claim—the Carlisle—the ore is within 8 ft. of the granite. Some 19% copper ore has been shipped from the Copper King, and some 22% stuff from the Carlisle. This was smelted at the Tyee Copper Co.'s smelter, at Ladysmith, on Vancouver island. Such selected ore contains a couple of ounces of silver and from $1 to $5 in gold. A



Part of the Yukon Territory, Canada.

5-drill Ingersoll compressor, with one 2¾-in. drill in use, and a steam hoist capable of work to 500 ft., constitute the equipment. The men are paid $3.25 and board (worth $1.25 per day). When engaged in shaft-sinking, $4 is paid. Work was started this year on May 15. The drift from the adit struck brecciated limestone and oxidized ore, suggesting a cavernous formation. The ore at this place also contains bornite with tremolite and garnet.

In riding from one mine to the other, the traveler will see numerous and different kinds of stakes and bench-marks left by the topographical, geological, and geodetic surveys of the Territorial and the Dominion governments, but he will see but few signs of the use of a transit underground. It seems as if

*'Some New Points in the Geology of Copper Ores.' MINING AND SCIENTIFIC PRESS. March 30, 1907. Also 'The Copper Deposits of San Jose, Tamaulipas, Mexico.' Trans. A. I. M. E. Vol. XXXI, pp. 178-203.

some of the itinerant surveyors might give the prospectors a line once in a while.

On leaving the Copper King, the road, along Macintyre creek, is seen to cut through the granite. The garnetite limestone follows the contact with the granite, but the ore itself is away from the granite, although enclosed within the garnetite limestone. Approaching the Pueblo workings, the road cuts through drift material well suited to road-making. The Pueblo was owned by the British America Co., one of Whitaker Wright's flotations, until 1906. It is now controlled by Byron White, of Spokane. C. P. Seale is in charge. A large mass of copper-bearing hematite in limestone is exposed in open workings. The dimensions are 215 ft. one way and 325 ft. the other, with a face 33 ft. above the level surface. A shaft and winze prove the continuity of the orebody to a further depth of 92 ft. A cross-cut 123 ft. long shows about 100 ft. of ore, with the breast in stuff of the same character, but poorer. The entire mass is cut lengthwise by a crevice 2 to 3½ ft. wide, having a slight dip to the east, filled with glacial drift. This open fissure goes down at least 25 ft. The walls are eroded, as if by water. The granite is 150 ft. east of the ore. When at its best the ore exhibits chalcopyrite and even cuprite. The average is 3% copper and 40% iron. About 700 tons have been shipped at various times to the Tyee and Crofton smelters, chiefly the former. This orebody has been sampled so frequently that it is in danger of removal by too inquisitive engineers. The faces of ore show the channelings of many samplings and testify to visits from experienced men.

Another important mine is the Arctic Chief, which I did not see. But R. F. Jones, the superintendent, is an old Colorado acquaintance, from whom I obtained reliable notes. Moreover, this mine and the White Horse copper district in general have been described by W. J. Elmendorf in a series of four articles appearing last February in *The Mining World*. On the Arctic Chief there are two adits, one of which is intended to cut the ore 170 ft. in, and at a depth of 110 ft. The ore is bornite and chalcopyrite with magnetite, associated with garnet and epidote. It is said to average 4½% copper, with $1 in gold and 2 oz. silver per ton, for a width of 40 ft. and a length of 200 ft. By way of comparison with the hematite ore of the Pueblo, it can be said that the latter carries about 2 oz. silver but only a trace of gold. Gold is rarely to be seen in the White Horse copper ores, although most of the selected stuff assays about $1 in gold. The principal orebodies carry an excess of iron and command a low rate for smelting.

The cost of transport to the railroad has handicapped the development of this district, but an exaggerated notion of the value of the mines has been a greater drawback. The drop in the market price of copper proved a stunning blow. This summer there were only 25 men at work in the whole copper district, but a branch line of railway was being constructed for a distance of 11 miles from the main line so as to tap the principal workings. This work was stopped before it was finished, but it is hoped that it will not be abandoned. We hope also that the mine owners will do their share to test the value of the copper deposits. Not enough has been done to warrant either the statements of promoters or the condemnation of a critic. These limestone contacts are ideally adapted for prospecting with the diamond-drill. The operators seem to hug the idea of defined lodes; they shut their eyes to facts that prove unmistakably that the deposits are irregular impregnations close to a contact between limestone and granite.

TIN DEPOSITS OF SEWARD PENINSULA.

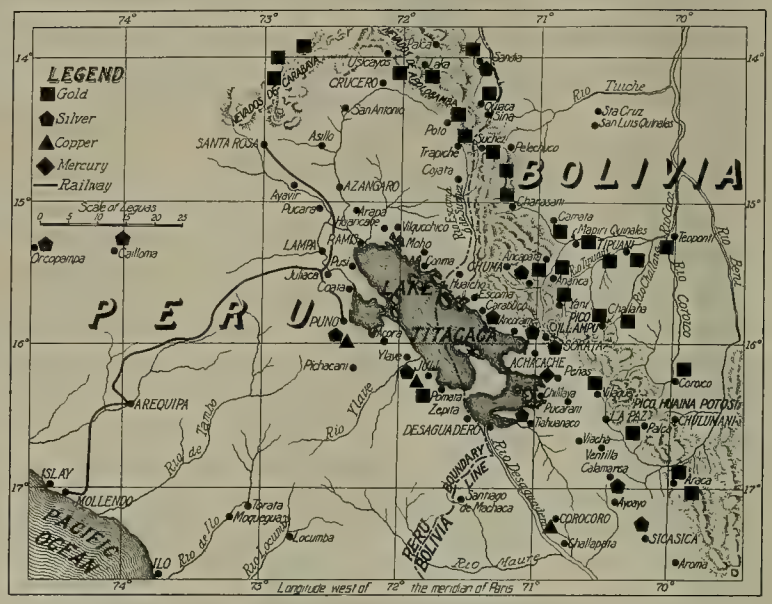
Stream tin was discovered in the York region of Seward Peninsula during the fall of 1900 as a heavy and objectionable constituent which accumulated in the sluice-boxes of the placer-gold prospectors, afterward identified as cassiterite. The true nature of the mineral once known, search was directed toward finding a wider distribution of the tin-bearing gravels and toward discovering the bedrock source of the cassiterite, the search being stimulated by the failure of the gold placers of the region and the high market price of metallic tin in recent years. In a report by Adolph Knopf, recently issued as Bulletin No. 358 of the U. S. Geological Survey, the following observations are made:

Developments in this region have been sufficient to demonstrate, at least, that the granite-limestone contacts are not favorable places to hunt for commercial bodies of cassiterite ore. Quartz porphyry dikes, locally known as lodes, or even as quartz veins, have been prospected to some extent, owing to the fact that the original discovery of lode tin in Alaska was made in a mineralized or altered dike of this character. The value of any such dike depends on the number of cassiterite stringers which it contains, and the closeness with which they are spaced. Of itself a quartz porphyry dike has no value. The unwelcome fact should be speedily realized that few of these dikes hold out any inducements whatever as prospective tin producers. Most of the developments throughout the region are still in the prospecting stage, and many of the open-cuts have not uncovered solid bedrock. No tin-bearing rock, except at one place on Lost river, has yet been blocked out. Small holes in the ground, which give no clue to either dip, strike, or persistence of the orebody, are held at enormous figures. The great need of the country is less desultory prospecting. The slate area deserves more careful examination, as it is possible that valuable quartz veins may exist within its confines. The distribution of stream tin in Anikovik river and its tributaries proves that the stanniferous mineralization is not limited to the region at the head of Buck creek, but is more widely spread throughout the slate belt. It is probable that a great granite mass, of which the stocks at Brooks mountain, Tin creek, and Cape mountain are protruding bosses, underlies the entire York region. As the region becomes better known and more thoroughly prospected, additional discoveries will probably be made from time to time.

SAN ANTONIO DE POTO HYDRAULIC MINE, PERU.

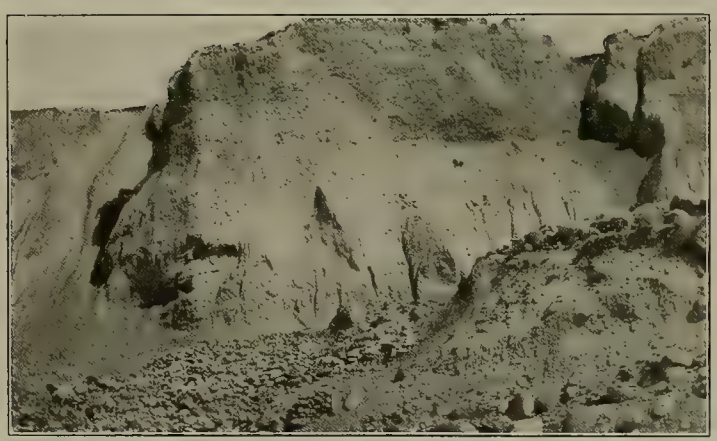
Written for the MINING AND SCIENTIFIC PRESS
By W. E. GORDON FIREBRACE.

This famous placer mine is situated in the District of Poto, Province of Sandia, Department of Puno, in southern Peru, at an altitude of 15,600 ft. above the level of the sea. The mines were discovered in the year 1553, shortly after the conquest of Peru by the Spaniards, and from the many old workings, reservoirs, canals, and ditches which are found, as well as the enormous quantities of tailing to be seen, it is evident that ground-sluicing had been carried on upon an extensive scale. It was not until the year 1893 that any attempt was made to work the mine in a systematic manner, when an American mining engineer named Meyers was engaged by Juan Manuel Peña y Costas, the owner of Poto, to put in a hydraulic installation. Two monitors were installed and work was commenced. The results obtained were excellent, but since the resignation of Mr. Meyers the management has been entrusted to men who have had little experience in the practical operation of a hydraulic mine. There never has been an adequate supply of water available for the proper working of this deposit, nor has there ever been, until lately, any serious attempt at endeavoring to provide a sufficient water supply to work for even as much as nine months in the year. It has always been assumed that this enormous gravel property was above the existing watershed, and the successive managers, accepting this as a fact, were content to work with whatever water was available during the wet season. Two years ago an Argentine company secured an option upon this property and sent engineers to verify the gold content and, if possible, to find an adequate water supply. The result was satisfactory. A supply of water equal to 1500 miner's inches was discovered, and although the bringing in of the water will be a costly undertaking, yet the gold value discovered was sufficient to warrant the expenditure.



Map of a Portion of South America.

The district of Poto is bounded on the east and northeast by a chain of snow-clad hills, which are known as the third Cordillera of the Andes, and which is the eastern boundary of the great plateau of Titicaca. The principal rock in this range is slate. The mountains rise to a height of from 18,000 to 20,000 ft. above sea-level. The formation is intersected by innumerable quartz veins, many being rich in gold. During the glacial period the Cordilleras were extensively eroded and the disintegrated mass or moraine now forms the auriferous deposit of San Antonio de Poto. This ground-mass or moraine is composed of small boulders of slate, quartz, granite, porphyries, and sandstone, held together by a cement of finely disintegrated slate and clay, and resting on a bedrock of slate, through the whole of which, from surface to bedrock, free gold is disseminated.



Highest Part of the Bank.

In extent the property is 6000 metres (3.73 miles) long, 1000 metres wide, and 40 metres deep, and contains approximately 240 million cubic metres of gravel (1 cu. m. equals 1.3079 cu. yd.), the average of which is estimated to be 25 cents gold per cubic metre. Large quantities of gold have been won from this property, but the gravel washed in the past has been insignificant, and has hardly affected the value of the property. There are several exceedingly rich pay-streaks

or *reuelos*, running through the deposit, but the gold is quite evenly distributed throughout the whole mass. There is no barren gravel, and consequently there is no overburden to be removed before getting into 'pay dirt'. Some of the gold is coarse, nuggetty, and flaky, small nuggets weighing up to half an ounce being frequently found, but by far the larger proportion of the gold is in a fine state of subdivision, though not as fine as that called 'float gold'. The gold is very pure, and is purchased by the Peruvian mint at the equivalent of $20 U. S. Cy. per ounce.

The work actually in progress consists in attacking the south rim of the deposit with two monitors having 4-in. nozzles, working under a head of 125 ft. for as many hours per day as the water-supply will permit, and sluicing the ground broken through a flume having a grade of 6%. This flume is 160 metres long, and is constructed of 1½-in. timbers, which are much worn and generally in a bad condition. In section it is 4 by 2 ft. The paving is of stone, and the flume is laid from 15 to 20 metres above the bedrock. There

Monitors at Work on the South Rim.

are no appliances for the removal of boulders or the larger stones, which, if too heavy to be carried away by the Indian workmen, are left where they are, and are always a source of trouble as the work progresses. How profits have been made on the work in the past is beyond comprehension, as everything is done by hand labor; stones that should be sent down the flume are carefully carried out on the backs of Indians, and deposited on unworked ground. Even the trucks in use are not self-tipping and have to be emptied by hand.

Collecting Reservoirs, San Antonio de Poto.

The present water supply partly comes from Lake Comuní, which is at the foot of the glacier of the same name, and partly from the melting of the snow in the wet season. The water is impounded in the reservoir Sillacunca, and from here the water is conducted by a well built ditch, having a mean grade of 1 in 300, a distance of 2800 metres to the pressure-box, which is 125 ft. above the monitors. A large proportion of the present water supply is lost through seepage and evaporation, and the pipe-line is leaking at every joint. A new water-supply has been obtained, about 18 miles from Poto, and a quantity equal to 1500 miner's inches has been assured. The cost of conducting this water will be considerable, as there are two wide and deep depressions to be crossed, which can only be done by siphons.

The climate is severe and cold, but remarkably healthy, and although Poto is situated above the line of perpetual snow the water never freezes. There is no actual rainfall, but heavy falls of snow are of daily occurrence. The entire absence of rust is noteworthy, consequently the iron piping used for the water-main continues in good condition for years.

From Mollendo, the southern port of Peru, trains run daily to Arequipa, and thence to Juliaca and Puno. It is advisable to spend a day or two in Arequipa, which is at an altitude of 8000 ft. above sea-level, before proceeding to Juliaca, so as to accustom oneself to the rarified atmosphere, as from here onward it is one long climb. At one point, Crucero Alto, the railroad reaches a height of 14,666 ft. above the level of the sea. From Juliaca there are several roads to Poto, either by way of Tirrapata, thence along the Santo Domingo road, lately constructed by the Inca Mining Co., to Crucero, and then across to Poto. The shortest route, however, is from Juliaca to Huancané, thence to Cojata, and from there to Poto. The journey from the railroad to the mines takes about three days, and is made on muleback. This route is certainly the least trying, as there are excellent accommodations for travelers.

MINING ON THE SETENTRION.

Written for the MINING AND SCIENTIFIC PRESS
By MARK R. LAMB.

Imagine yourself working over a drawing-board, puzzling your tired brain with details of piping, fittings, tanks, and valves. Then get a wire reading as follows: "All right; be here Tuesday." Immediately is conjured the vision of a delightful ride through cool pine forests and grassy valleys, crossing mountain torrents and rugged ranges, the trip pleasantly broken by several nights of camping on streams alive with trout and frequented by game ranging from quail to bear.

The little short-line railway that stretches its fingers up the valleys of the western mountains is mildly irregular in its movements. The day we went out, the first pay-car in many months was hooked to our train. The accounts were closed to within five months, but as the boarding-house and store accounts were subtracted to date, many an Indian was told, when he asked for his pay, "Your account nearly balances; you owe the company only twenty *reales*." It is a good way to help them save their money! Construction work on the road is almost at a stand-still while efforts are being made to raise money for the completion of gaps. It will be the scenic road of the continent. In many places, where deep canyons have to be crossed, the advance of one kilometre is made at the expense of 20 kilometres of rails. There are places where the precipice drops 5000 ft. We reached the Barranca de Cobre at lunch time, and, in spite of our anxiety to go ahead, we halted to absorb the magnificent view. The rain had just stopped, and the sun shone on the vivid green of the tropics contrasting with the grays and reds of the soft tuffs and sandstones. Small clouds formed far down in the branches of the canyon, rose rapidly in the warm currents of air, only to dissipate as they approached the rarer and drier elevation upon which we stood. Ridge after ridge that would otherwise have been merged in the range miles away was brought out clearly by these glistening mists. In the summer, when the bottom of the canyon is like a fiery furnace, the draft over the divide where we stood is continuous and strong, so strong that hats or clothing thrown over the precipice are returned with interesting regularity and precision. Down in this canyon is a copper mine that is said to have reserves of ore equivalent to the whole western plateau. The mine is at the bottom, and if the ore reaches to the top, Butte miners might as well take a holiday.

During the winter this trip is a cold one. A 'tenderfoot' of the party noticed that the Tarahumari *mozo* had no blankets and only thin clothes. Kinder than the rest, he insisted on giving the Indian one of his heavy blankets, saying that although he himself would be cold without it, he would not be able to sleep at all with the poor Indian suffering! The Indian took the blanket, watched the others roll up in theirs, finally rolling up his for a pillow, and apparently slept comfortably! Then Mr. B. was mad! He could not sleep on account of the cold, while his companions could not sleep on account of the warmth of his language.

After our several days of travel, we reached the Setentrión river, climbing down a steep trail to the bottom of the canyon, over half a mile deep. The river is called Setentrión where it passes that place, but it is called the Santa Barbara, the Rio Plata, and the La Guasa, besides several other names, at different points, so that a traveler in Mexico must usually know a dozen names for each river. This one has cut deep into the plateau and, with its tributaries, has opened up possibilities for prospectors. One extraordinary exposure of ore occurs near the old, almost deserted, town of Setentrión. It is spoken of as "the sixty acres of ore". The hanging wall of a vein has been eroded, actually exposing 60 acres of silver ore on the slope of the mountain. The ore has an average value in silver of only ₱10 per ton, much too low to be profitably handled in that neighborhood.

The mines of Setentrión are very old, having been worked in the times when each was a law unto himself. It is told that a former owner, being considerably in debt to the merchants of Alamos, was reported to have uncovered rich ore. Whereupon the Alamos merchants sent an attorney to visit Don Luís, in an attempt to secure the mines for the debts. The old gentleman was pleasant to his visitor even after knowing the object of the visit. Among other places of interest was an immense boulder, in which it had pleased his fancy to carve a tiny jail, fitted with barred doors in true dungeon style. Don Luís escorted the lawyer into this place, then quietly closed and locked the door from the outside. "Now," he said, "I am ready to discuss the matter of my debts. Inasmuch as you have power-of-attorney, I desire a full quittance of my debts. The mine *is* in bonanza, and as fast as possible I shall pay the accounts, but I do not like legal entanglements." It is said that the attorney promptly agreed that this was a good scheme. Buried treasure has frequently been found in this neighborhood. Two simple natives of Chínipas found a large case of gold, and to avoid paying 5% to the Government, told a learned friend of their find and asked his advice as to the best method of disposing of the treasure. They told him where it was, and he promised to take care of it. This he did, or at least, they think so! Owing to bandits, wars, and the generally unsettled condition of Mexico in years past, much treasure has been buried. On a certain night in May—I decline to give the exact date—all buried treasure glows with a strong unearthly light, and those lucky enough to know the date spend that night searching for wealth ready made. If the treasure consists of placer gold it will have increased a regular amount each year—grown, in fact—but plate, coin, or other metal which has been melted, of course, does not grow. On our way out one of the party noticed a clump of pines a little way off the trail, apparently planted regularly, and in its midst a square, covered with stones. Upon pounding the spot with a rock, it certainly sounded hollow, but as we had nothing but knives to dig

with the excavation of this treasure was finally postponed until the next trip.

We also saw a limestone cave where the Indians, during an epidemic of black smallpox, had taken the dead, and the dying also, in order to stamp out the plague. It happens that lime is much needed in a camp near there for use in cyanidation, but this cave is let severely alone. And speaking of limestone, the limes of Mexico are rarely pure, yet for strength they seem to be unequaled by anything but cement. Near Setentrión was a masonry bridge, now fallen, but one of the piers that rested on a smooth boulder is still in place, though the boulder has moved from its original site. The pier now stands at an angle from the vertical, and is subject to the full force of the violent floods typical of this region, behaving as though it were a part of the boulder.

These violent Western rivers have cut through the tufa and exposed a network of veins which could not be found were it necessary to pierce the capping. One mine, discovered by a *peon* who was 'grub-staked' by two Mexican *rancheros*, produced a shipment of ₱55,000 from the cropping. The *peon* took his first hundred *pesos* and drank himself out, so the ownership became invested in the two men. The prospect was offered to an American representative of capital looking for mines, not prospects. The American advised the owners to develop, which they did. Afterward, the former took over the property, and is now mining about 70 tons of ₱100 ore, out of which payments on the mine and on the new reduction plant are easily made. To show upon what small things a fortune sometimes hangs, an incident of the first trip of the purchasers may be related. The owner of the mine, figuring on the rate at which he himself traveled, perhaps also with the idea of minimizing the hardships of the trip, assured the Americans that the journey would require three days. After three hard days the mine was "*Ahi, no mas*!" (just there), until the new-comers became suspicious. On the fifth day he assured them volubly that they would surely arrive before noon. He was then assured that at noon they would most certainly back-trail. At noon the mine was in sight.

Alamos.

On the trail from the Rio Plata mines we passed hundreds of mules loaded with plates for the vats of the cyanide plant. The plates are awkward loads and are particularly dangerous. The freighters make a wooden frame, which is tied securely to the plate with thongs. Then the roping of the load to the mule is made fast to this frame. The plates flop about, on the trail, and their sharp corners are so many deadly weapons. Rarely does a pack-train get in without injured animals. My own saddle-mule, in passing a train on a narrow trail, was cut three times in as many seconds. The freighting of these plates costs ₱12, which is slightly more than the cost of ordinary loads, though the plates are lighter. They are limited in size to 4 by 6 ft., and the curve adds to the difficulty of packing. It takes a strong energetic man (and a strong vein of ore) to propose and carry out the building of a reduction works under such conditions. Many difficulties are overcome in getting over these trails. Heavy pieces that cannot be sectionalized, such as cam-shafts, are always troublesome. One freighter made four small wheels for

Chihuahua.

A Railroad Terminus.

each shaft and attempted to drag five to the mine. As fast as a wheel broke, another was cut from the adjoining timber, so most of his time was spent making wheels. Upon looking at the trail one would promptly say that the transportation of shafting this way was impossible, yet he succeeded in getting half way before giving up the contract. The best way to transport the heavy pieces is to see a neighboring Indian chief and arrange with him for carriers. He uses much persuasion and authority, with a little money, to secure relays of ten or more for each shaft. In this way they make five miles per day, which makes the freight for one shaft amount to ₱350. One company tried to use pipe for shafting, but as this has been replaced with solid shafts, the experiment could not have been successful. Everything heavy must be sectionalized where possible. I remember at one time, during sickness in camp, the doctor insisted on having a trained nurse. She was fair, fat, and forty, and more than a safe load for one mule, so—well, it was not possible to sectionalize!

Governor Shepherd is credited with offering to pay for a piano for his staff in Batopilas, if they would pay the freight. It was carried by hand the entire distance from the then terminus of the railway, and, of course, the freight was much more than the first cost. At one time an enthusiastic party of ladies, prospective investors, journeyed from New York to Batopilas. Joslyn, who was the best-looking man in camp, besides being quiet, dependable, and widely experienced, was detailed to escort the party from the railway to the mines. This would seem to be an easy and pleasant job, but appearances are often deceiving. Hardly any of the ladies had ever been on a mule before. Each thought she had the hardest-riding animal, the first day out. Anything was an excuse for a stop the second day. If a pretty stream was crossed, nothing would do but the tent must be set up over it, and all hands took a bath. A field of wild flowers was good for an hour's delay, and after orchids were recognized the party hardly moved. It is said that the party was barely started some mornings by noon. One lady insisted on riding Joslyn's mule, though warned that the animal was tricky. She was no more than mounted when the mule turned and bit her leg. Even then she was not satisfied, insisting that Joslyn just *knew* the mule would do that! He finally landed them at the mine, his hair turned gray. He hastened to resign before the party was ready to return.

Such was the story as I got it on the trail, and I must add that I believe it, but if any of the party will advise me of any errors, I shall be glad to make the proper corrections. It seems a difficult trip for women, at the best, though many make it. Where riding a mule is out of the question, it is only a little more trouble to provide relays of carriers and travel in a chair. The rate of travel is nearly if not quite as fast, and the journey is made in much more comfort. Even babies make the trip. As a suggestion conducive to comfort in traveling, I would advise mining men who expect to journey much in Mexico to arrange for children in pairs, as otherwise the question of packing the odd one is sometimes difficult. The two balance each other nicely in panniers on each side of the mule, while the odd one must be over-balanced by a bed or grub-box or under-balanced by a valise or a camera.

Training of apprentices is one of the most important problems with which modern industrialism has to deal. A number of railroad companies, as explained by William Menkel in the *Review of Reviews*, have established systematic courses of study for young men, to which older workmen are, in some cases, also admitted. This work has now passed the experimental stage. In the night school conducted by the Union Pacific in its Omaha shops, attendance by apprentices is compulsory. A regular three-year course is mapped out, including arithmetic, elementary mechanics, and mechanical drawing. The Omaha Public Library has established a special branch at the shops, containing books on mechanics and engineering, to which the men have free access. As soon as the boys finish the course properly they are put at responsible work. A similar apprentices' night school is maintained by the Oregon Short Line at Sparks, Nevada, under supervision of a professor from the State University. A feature of this school is the time-credits allowed to the boys for punctual attendance and proper interest. This credit amounts to 30 days for each year, and is applied on their apprenticeship. In its transportation department the Oregon Short Line trains young men as brakemen, under the care of experienced crews. The students are drilled in the methods of handling trains, and are required to study the rules and regulations of the operating department. Their progress is carefully watched, and when proficient they are recommended to the train-masters, by whom they are thoroughly examined before qualifying as regular brakemen. Although the services of these young men are not of much value while they are learning the business, the company pays them sufficient wages to support them during their apprenticeship. The Grand Trunk road has had an apprenticeship system in successful operation for a number of years. Applicants for an apprenticeship must first pass examinations to prove their moral, physical, and mental qualifications for service as a mechanic. They are then indentured to the machinist's trade for five years, or to the blacksmith, boilermaker, or other trades for four years. Five cents per day is deducted from the wages of each apprentice, and the total sum is returned to him at the end of his apprenticeship, together with a bonus of $25 if his services have been satisfactory. Examinations are held each year, and prizes are awarded. Upon completing their apprenticeship the young men receive certificates officially setting forth the fact that they are competent mechanics. The Grand Trunk also supports six scholarships at McGill University, where there is a course in transportation. These scholarships are open to the sons of employees as well as to the younger men in the employ of the company, and are eagerly sought for, two usually being awarded each year.

STAMP-MILL PRACTICE ON THE MOTHER LODE.

Written for the MINING AND SCIENTIFIC PRESS
By ALEX CHALMERS.

The ores of the Mother Lode in California, as a general rule, are low-grade, and in addition to good management, require the most efficient machinery to work them to a profit. Any improvements in methods or machines that tend to reduce the costs of mining and milling mean ultimately a greater industrial activity and a larger yield of the precious metal. On the Lightner mine, at Angels Camp, we have, within the past year, had some experience in milling that has been profitable to us, and should be of interest to others. The Lightner mine is about in the centre, north and south, of the Mother Lode, and the ore is typical of this great belt.

On October 30, 1905, our entire plant above ground was destroyed by fire. Previous to this date we had been operating successfully what we considered the most modern stamp-mill in California. After clearing away the ruins, we set about to duplicate the entire arrangement, and on February 16, 1906, we again had our 40-stamp mill in active operation. The reconstructed mill did fully as good work as the mill that was burned, crushing every day of 24 hours, about 200 tons of ore, or an average of 5 tons per stamp. In 1907 our ore reserves increased to such an extent that we decided to augment our milling capacity by adding 20 stamps to the "old mill" of 40 stamps. This new mill began crushing on November 15, 1907. The entire iron-work was supplied to us by the Angels Iron Works, and was designed by the manager of that foundry, D. C. Demarest.

Soon after dropping the new stamps we were agreeably surprised to find that it handled considerably more ore per stamp than the "old mill", that the loss in tailing was no greater, that it required no more power, and that the percentage of amalgam recovered inside the mortars was larger than in the "old mill". Among other interesting features, it may be mentioned that this mill requires no more water, either for battery or for concentrators, and that the life of both the shoes and the dies is prolonged. This new plant is crushing from 10 to 15% more ore than our old mill, with no more expenditure per stamp for power, water, and labor, and with less cost for wear and tear.

Some of the details of the new mill are as follows: The stamps weigh about 1000 lb. each, and are given a drop of 7 inches, at a speed of 106 drops per minute. The height of discharge above the die is 7½ in., punched screens of 30 mesh are used, and each battery has 308 sq. in. of clear screen-opening. The shoes are made of chrome steel and Pennington hammered steel, weighing, when new, 181 lb., and when worn out, from 25 to 30 lb. They last about 10 months. Semi-steel dies are used, 5½ in. high, weighing 82 lb. when new, and about 30 lb. when worn out, after a service of 8 months.

The mortars are known as the 'close pattern', and there is no surplus room, either between the stamps themselves, or between the stamps and the linings of the mortar. The stems are held rigidly in place and in alignment, and are made more efficient as crushers by a patented iron guide known as the Pacific Battery Stem Guide. The mortar-blocks are of sugar pine, resting on concrete foundation.

Each battery is equipped with 88 sq. ft. of copper plate, 2½ oz. silver per square foot. These plates are arranged in lines 2 ft. wide by 22 ft. long, all on a grade of 2 in. per foot. Three 4-ft. Frue vanners take the pulp from each 5 stamps. Each battery requires a water-supply of 8 gal. per min. and each concentrator a water-supply of 1 gal. per minute.

The mill is driven by a 50-hp. induction motor. The 20 stamps, 12 Frue vanners, 36 ft. of 4-in. mill line-shafting, and 34 ft. of 2-in. concentrator counter-shafting consume 40 horse-power.

The tailing is sampled automatically, showing an average loss, on ore ranging from $3 to $6 per ton, of 20 to 25c. per ton of ore crushed. This loss is practically the same in the old and the new mill. Inside the mortars of the old mill we recovered about 20%, while in the new mill this percentage never drops below 25% of the assay-value.

Ordinarily it requires but six men to look after the entire 60-stamp mill. There are times when chips are coming freely from the mine; then two additional boys are required to keep the mortars free from these wood particles. It may be mentioned that our screen-frames are all equipped with a pocket, provided with a little hinged door, so that the mill-man can get his hand inside the mortar without removing the screen-frame. This device saves time on account of there being so many chips in the ore.

Our labor cost for milling averaged about 22½c. per ton with the old 40 stamps, while with the entire 60 stamps this cost ranges from 20 to 15c. per ton.

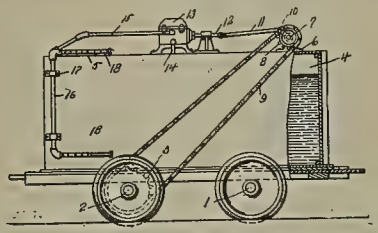
The Belgian method of tunneling through soft ground was first employed in 1828 in excavating the Charleroy tunnel of the Brussels-Charleroy canal, in Belgium. The distinctive characteristic of the method is the construction of the roof arch before the side walls and invert are built. The excavation therefore begins with the driving of a top centre heading, which is enlarged until the whole of the section above the springing lines of the arch is opened. The roof arch is then built, and is, of course, supported by the unexcavated material below. This material below the springing lines is excavated by taking out first a central trench to the depth of the invert, and then by removing the two parts on either side. As these side parts have to support the arch, they must be excavated in such a way as not to endanger it. Hence, at intervals along the central trench, transverse trenches about 2 ft. wide are excavated on both sides and struts are inserted to support the roof arch, and masonry which has probably been built by that time. The completion of the excavation consists in widening these transverse trenches.

Consumption of lumber in the United States in 1850 was 250 ft. per capita, and 480 ft. in 1907.

MINING AND METALLURGICAL PATENTS.

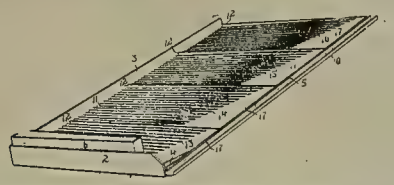
Specially reported for the MINING AND SCIENTIFIC PRESS.

SPRINKLING-CAR FOR MINES.—No. 902,950. Peter Doney and Alexander P. Cochrane, Monongahela, Pennsylvania.



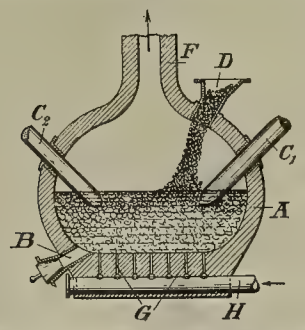
A sprinkling car of the type described comprising a tank and wheeled trucks supporting same, a pump carried on the top of the car, a gearing connecting the pump with the axle of one of the trucks, combined with a substantially U-shaped sprinkler frame embodying a perforated pipe extending across the top of the tank and in communication with the tank through the pump, vertical pipes communicating at their upper ends with said top pipe, perforated branch pipes projecting longitudinally from both ends of said vertical pipes; the said top pipe having its perforations directed to project the water upwardly and the said longitudinally extending branch pipes having their perforations directed to project the water both laterally and downwardly.

ORE-CONCENTRATING TABLE.—No. 895,168. Emil Deister, Fort Wayne, Indiana.



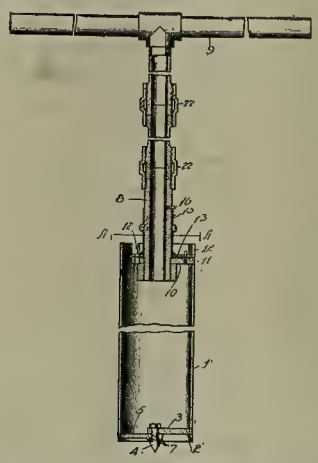
In a device of the class described, a reciprocating table; a projecting breast-board along the rear side thereof; and a series of riffles upon the surface of the table arranged in successive similar groups, the end riffle of each group extending to the mineral discharge edge of the table, the other riffles of the respective groups increasing in length successively toward the corresponding end riffle thereof, all of said riffles being tapered from their inner ends at the breast-board to their outer ends, the said end riffles increasing and the other riffles decreasing in height successively toward the tailing discharge end of the table.

PROCESS OF OBTAINING METALS FROM THEIR ORES.—No. 904,263. Karl Kaiser, Berlin, Germany.



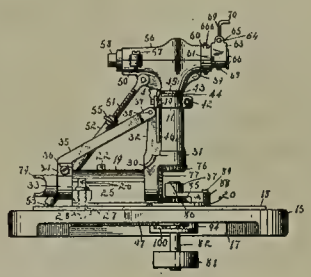
The process of obtaining metals from materials containing oxidizable substances, which consists in heating the raw materials in an electric furnace, then forcing a gaseous oxidizing agent into contact with said heated materials, then forcing a gaseous reducing agent into contact with the heated material, leading off and condensing metals escaping in gaseous form, and running off the liquid metals into molds.

PROSPECTING-DRILL.—No. 903,194. Anton W. Johanson, Chicago, Illinois.



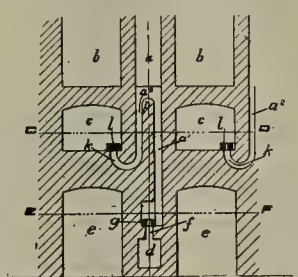
In a drill of the class described, the combination of a drill tube, a shank of less diameter than said tube and adapted to have detachable interlocking engagements with the upper end of said tube, and means for preventing the accidental disconnection of said shank from said tube through the rotation of said shank in either direction.

ROCK-DRILL.—No. 904,436. John H. Huhn, Fairmont, West Virginia.



In a drilling machine, the combination with a bed-plate, and a base pivotally mounted thereon, of a horizontal sleeve mounted to rock in said base, a drill stock joined to said sleeve and extending at an angle therewith, drill operating means carried by said sleeve and drill stock, and a driving shaft having its axis lying in the same plane as the axis of the drill stock.

COKING-OVEN.—No. 904,268. Edmond Ledoux, Sheffield, England.



In a coking oven, the combnation of a series of vertical heating flues, a gas canal below such flues, a gas opening therefrom leading to each flue, a series of adjustable dampers for regulating the supply of gas and operable from the front of the oven, and an opening in the oven front through which a suitable implement may be inserted to operate any one of the series of dampers, substantially as described.

A Mine Power Plant.

By George M. Crawford.

*The extension of mining operations over a considerable area of ground is now common in both coal and ore mines. In such instances the generation and transmission of air and electric power assumes new and interesting aspects.

A Standard Compressor.

The power used for mining machines, pumps, drills, hoisting and haulage, ventilation, etc., may be produced: 1, in several independent plants, each with boilers, generator, sand steam or belt-driven compressors; 2, in a central station, with large economical steam units, the air being piped and the current wired direct to the machines; 3, in a central electric generating plant, from which current is wired to sub-stations, where the air-compressors and motors that drive the machinery in each part of the field are erected.

The first plan is now seldom adopted, owing to the high cost of supplying fuel and water to each of several plants, and the duplication of attendants. Further, the system lacks economy and flexibility, because, as the workings are extended, the power lines become longer, more expensive to maintain, and reduce the efficiency of the whole plant. Such a plant can be moved to a new site only at heavy expense for buildings, machinery, and facilities for transporting supplies.

The second plan is more convenient and economical in the production of power, but is wasteful in transmission. It requires long air-lines of large size and electric wires of large diameter to carry a low-voltage current suitable for machine operation.

The last plan represents the latest practice. It involves the production, in a central plant, of high-voltage current by steam or hydraulic turbo-generators. This current is then carried to sub-stations, where it operates air-compressors, fans, pumps, and haulage locomotives. This results in the greatest possible economy of pipe-lines, wiring, attendance, buildings, and supplies. When the workings are extended to the point of diminishing returns, a new sub-station may be erected, or the old one moved, at but small expense, and the piping and wires may be used over and over.

The following description of such a power plant will interest mine managers:

The mines of the Cowanshannock Coal & Coke Co. are at Yatesboro, Pa. Shipping facilities are provided by a branch of the Buffalo, Rochester & Pittsburg railroad. The company owns about 19,000 acres of coal land, covering an area about four by nine miles in extent. The mines have been worked for about eight years, during which some 1000 acres of coal have been mined.

The coal is broken exclusively with Sullivan compressed-air pick machines of the Class 5 type. This machine, of which 92 are in use, has a cylinder 5⅛ in. diam., cuts to a depth of 5½ ft., and weighs 825 lb. After the coal is undermined, three holes are drilled in the face to receive one-inch powder. The charge is 6 to 8 in. long. The centre is shot first, and after this tight shot, the two sides or loose shots, the latter breaking down the coal which hangs to the rib after the centre has been freed.

The photograph shows two compressors of the Sullivan WJ, duplex, two-stage type. The low-pressure cylinders of these machines are 24 in. and the high-pressure cylinders 14½ in. diam., with a common stroke of 18 in. They furnish 1414 cu. ft. free air per minute at 150 r.p.m. These machines are of the best design. The cylinder bodies and heads are water-jacketed, and the air-intake passages are so arranged as to keep the water-jacket between the incoming air and the cylinder wall up to the point of entrance to the cylinder. The inter-cooler is of unusual area, and the air is forced to take a circuitous passage across the cold tubes in its way from one cylinder to the other. Moisture carried by the air through the first stage of compression is practically all condensed and removed in this cooler. The inlet valves are of the semi-rotary pattern, driven by eccentrics on the shaft. This valve motion and the large diameter of the valves give a free opening for the air, and quick

Sullivan Rock-Drills in a Colorado Mine.

Sullivan Duplex-Belted Air-Compressors.

Sullivan Coal Pick-Machine.

*Abstract from *Mine and Quarry*.

closing, which insures a full cylinder at each stroke. The valves are so set that air-pressure from the cylinder holds them to their seats, minimizing leakage. Automatic poppet-discharge valves with removable seats render inspection and care easy. The eccentrics, piston rods, and connecting rods are enclosed in a dust-proof case, and these parts are automatically oiled from tanks in each frame, into which the lower edges of the crank-discs dip. These machines are practically automatic. The frames are of the 'heavy duty' type, and the whole machine is supported on an iron base to insure correct alignment.

These compressors were constructed especially for this work. As it is contemplated that the sub-stations will be moved from time to time, the base of each machine is cut through the centre and bolted together. When the machine is knocked down, any part of it may be hauled by wagon. When being re-set, perfect alignment of all parts is provided for by means of dowels.

The installation of this central plant enabled the company to discard 10,000 ft. of 8-in. pipe line, together with many hundred feet of smaller pipe, which are being lifted from time to time, as conditions permit. The advantages of this plan of installation are easily seen. The high voltage permits but small losses in transmission; the generation of power so close to the machines minimizes the loss of efficiency; and the mobility of the entire plant prevents waste of capital and labor in extending the development of the property.

Commercial Paragraphs.

The Ernst Wiener Co. announces that its Pittsburg office will in the future be in the Union Bank Bdg., with Mr. John T. Cawley in charge.

W. B. Preston, formerly with the Denver Fire Clay Co., is now representing F. W. Braun, Los Angeles, and Braun-Knecht-Heimann Co., San Francisco.

Smith, Emery & Co., Inc., San Francisco, has added a mining department to its business, and will maintain a staff for consultation, examination, metallurgical tests, and assays. W. C. Bass is manager.

Robert W. Hunt & Co., Chicago, announce that they have been awarded the inspection of the structural materials entering into the construction of the new Chicago & Northwestern railway terminal station. It is estimated that 24,000 tons of steel will be used.

The Wagner Electric Mfg. Co. announces the appointment of Frank N. Jewett as general sales manager, with headquarters at the main office and factory in St. Louis. Mr. Jewett has been district manager of the Wagner company at Chicago for the last three years.

The Mayer Boot & Shoe Co., Milwaukee, the largest shoe establishment in the Northwest, has just closed its fiscal year, and reports an increase in sales over the corresponding period of last year. This exceptional showing in a year of depression speaks for the merit of Mayer shoes.

Catalogues Received.

The Brown Hoisting Machine Co., Cleveland, has just issued its new Bucket catalogue, which contains description and illustrations of 'Brownhoist' grab buckets for handling coal, ore, limestone, and the like.

The Blake & Knowles Steam Pump Works, New York, has just issued five bulletins, as follows: K-813, Knowles Sinking Pumps; K-814, Knowles Boiler Feed and Tank Pumps; B-815, Blake Boiler Feed and Tank Pumps; B-817, Blake Vertical High Speed Engines; and K-818, Knowles Single Horizontal Piston Pumps.

The Western Electric Co. has recently issued Bulletin No. 5532 on Victor flaming arc lamps. A special feature of this lamp is the absence of any regulating mechanism for controlling the regulation of the arc, this being accomplished by the action of gravity as the carbons are burned away.

Decisions Relating to Mining.

Specially reported for the Mining and Scientific Press.

INJURY TO MINER—CONTRIBUTORY NEGLIGENCE.

A coal miner, killed by the falling of the roof of the mine where he was working, was not guilty of contributory negligence in working under the roof when he knew of the defect in the roof, and voluntarily went under it, unless it was shown that he knew the defective roof was dangerous; it was the owner's duty to prop the roof and make it safe. But under such circumstances there could be no recovery where the mine boss warned him of the danger and instructed him not to work under it.

Mascot Coal Co. *v.* Garrett, (Ala.) 47 Southern 149, June, '08.

MINES—CONVEYANCE AND LEASE OF MINERALS.

A clear distinction exists between a grant of a right for a term of years to take mineral from certain premises, coupled with the right of ingress and egress, and the direct sale of such mineral in place; the latter amounts to a conveyance of an interest in the land itself, the former does not, and is not taxable.

Board of Supervisors Hancock County *v.* Imperial Naval Stores, (Miss.) 47 Southern 177, June, '08.

MINING LEASE—LIEN FOR ROYALTIES—FIXTURES.

A mining lease gave the lessor a first lien on all improvements to secure the payment of royalties on coal mined; and giving the lessee the right to remove the building, machinery, etc., subject to the conditions of the lease. Under the lease it was held that the building and machinery were not fixtures, and the lessor had no interest therein except the lien for unpaid royalties.

Cherokee Construction Co. *v.* Bishop, (Ark.) 112 Southwest. 189, May, '08.

INJURY TO MINER—MAKING MINE SAFE.

A carman in a gypsum mine, immediately prior to his injury, had been ordered to remove from the foot of the shaft a lode of props with which to support the mine roof, and such props were being unloaded and delivered to the prop setter when the carman was killed by the fall of a portion of the roof. Under these facts it was held that the carman was not engaged in making the mine safe at the time of his death, and, having no knowledge of the danger attending the failure to properly prop the mine, the mining company was held liable for failing to afford him a reasonably safe place in which to work.

Ianne *v.* United States Gypsum Co., 110 N. Y. Supp. 496, May, '08.

MINING CLAIM—FAILURE OF CO-OWNER TO CONTRIBUTE.

If one of several co-owners fails to contribute his proportion of the required work or make the necessary improvements, the other co-owners who have done the required work may give such delinquent notice, and after the stated time if such delinquent fails or refuses to contribute his proportion of the expenditures, his interest in the claim shall become the property of the co-owners. But the question of the performance of assessment work sufficient to prevent the forfeiture of the interest of a co-owner is one of fact for the jury to determine.

Knickerbocker *v.* Halla, 162 Fed. 318, May, '08.

INJURY TO WORKMAN IN QUARRY—CONTRIBUTORY NEGLIGENCE.

A workman injured in a quarry by rock falling from a wall cannot recover on the ground of negligence of the boss who sent him to shovel loose rock, or 'sprawl', near where there was loose rock in the wall which was likely to fall, and which he could have discovered by the exercise of diligence.

Alabama Con. Coal Co. *v.* Hammond, (Ala.) 47 South. 248, June, '08.

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EDITORIAL.

ASSESSMENT WORK on mining claims is a timely subject near the close of the year, and we are glad to be able to publish an authoritative article by Mr. William E. Colby, who is associated with Lindley & Eickhoff. He gives some good advice in a way that cannot be misunderstood. If you have not done your assessment work, hasten to do so, and do it honestly and intelligently, so that the law may be fulfilled and the mine developed.

WE PUBLISH a lengthy extract from the President's message, but the extract is only a small fragment of the last pronunciamento sent by Mr. Roosevelt to the Congress of the United States. Taken together the messages sent by Mr. Roosevelt to the Congress constitute a formidable and deeply interesting mass of writing. These messages have been widely read by the plain people and they have done much to mold public opinion. But they do need editing. If Mr. Roosevelt had a trained *précis* writer at his service, his communications would gain in force; they are too diffuse. The recent exchange of compliments with the New York *Sun* illustrates this. Mr. Roosevelt wrote a long invertebrate letter to a friend attacking the *Sun*; we were glad to see that attack, for the *Sun* is one of the most powerful of undermining and disintegrating forces in America. But the letter was too long. Mr. W. M. Laffan replied tersely, insidiously, effectively. Right was shamed and wrong chuckled.

AN EVENT of world-wide interest was celebrated in connection with the exercises of the Mining Congress at Pittsburg on December 3. This was the opening of a national testing laboratory for scientific investigation of causes and means for prevention of mine accidents. At the ceremony Mr. James R. Garfield delivered a sympathetic address, accentuating the need of a more tender regard for the protection of human life in the work of producing the nation's mineral wealth. This sentiment was emphasized by Mr. J. A. Holmes, who said, "the consumer does not want to burn coal stained by the blood of the butchered miner. The American people are willing to pay more for their coal. Pittsburg district is selling its fuel too cheaply. We pay 75 cents per ton for coal here; in Europe it costs $2 per ton. Let us have higher-priced coal and safer mining." Of course 75-cent coal, or even $1.15 coal, which is a more common figure for run-of-mine, at Pittsburg, becomes $2.50 at New York, and $3.25 at Boston. We do not refer to Western prices, which have made the metaphoric 'black diamond' a stern reality. The fuel will undoubtedly stand an increase of cost at the mine-tipple for the sake of safety, but the transportation companies need to readjust their

schedules to cheapen this great necessary of life to the consumers. This happy condition will come about only when the recommendations of the President for placing all railway matters in the hands of the Interstate Commerce Commission are enacted into law.

Mining Congress.

The eleventh annual session of the American Mining Congress recently held at Pittsburg was a useful convention. As it becomes older the Congress gains in dignity; the undesirable elements are being shed as it progresses onward; there is less wind and foam, and more real advance. We are pleased to note that this last session was devoid of papers of technical or scientific character, for the Congress is no fit occasion for the reading of such papers. On the other hand, addresses calculated to educate the general public were not wanting, notably those by Mr. James Douglas on the influence of transportation on the mining industry, by the Director of the Survey on the 'Distribution of the Nation's Wealth,' and by Mr. A. H. Brooks on 'The Mineral Resources of Alaska.' Such addresses would give value to any meeting. Although of less general interest, the papers by Mr. G. W. Traer on 'Conservation and the Coal Industry,' and that on the 'Northern Appalachian Coalfield,' by Mr. I. C. White, were of even more immediate application than the addresses that preceded. Mr. White's paper afforded an excellent illustration of the wide economic importance of certain features of geological work and was well designed to arouse public interest in the application of science to industry.

The meetings were enlivened by one or two debates. It was expected that the opponents of the Forest Service would have something to say and that Mr. Gifford Pinchot's friends would be eager to make reply. Fortunately, the good sense of those in control has resulted in the decision to leave the matter to the special committee, of which Mr. A. G. Brownlee is chairman, and a conference with the Federal officers will be held shortly at Washington. We note with interest that Mr. W. R. Ingalls, as chairman of a special committee on revision of the mining laws, recommended greater uniformity in the statutes of the different States and was able to announce wide-spread interest in such useful reforms. The onslaught upon the smelter trust by Mr. E. A. Colburn, of another committee, fell rather flat because the audience before which he spoke was interested in coal mining. While we appreciate that causes for irritation exist, we cannot see that anything useful can be done by general charges; to be effective, specific facts and figures must be adduced.

At this session there was no need to urge the creation of a National Bureau of Mines, for that is now assured. Senator Dick, who is chairman of the Senate Committee on Mines and Mining, promised that the bill establishing the Bureau would be passed by the Senate before March 4. Thus the American Mining Congress has achieved one of the main purposes for which it was organized. We tender our congratulations to the President of the Congress, Mr. J. H. Richards, who for six years has worked with a rare mingling of judgment and enthusiasm for this recognition of the mining industry. He deserves much credit for his public spirit; and it is obvious that his motives were wholly disinterested, for he has refused to allow his name to be used as a candidate for director of the Bureau of Mines. One of the memorable incidents of the meeting at Pittsburg was the renouncing by Mr. Richards of any ambition for the office and his cordial endorsement of Mr. J. A. Holmes, now chief of the Technologic Branch of the Geological Survey. It is likely that Mr. Holmes will get the appointment. He is a hard worker, a man of good sense, and much tact; in many ways he is particularly well fitted for the post. He has taken prominent part in several sessions of the Congress and has used the opportunity worthily to become known to those behind the movement for a Bureau. Thus the Congress will be responsible both for the Bureau and for its chief; this will enhance the importance of its annual conventions and enlarge its field of usefulness.

A Tariff Commission.

In business let us be exact, systematic, scientific; in government let us adhere to the primal independence of the untutored past, and revel in the joys of inexactitude, chance, and special privilege. Such is the logical deduction the observer is forced to make from the persistence of numerous rude policies in our system of government. The public retains more of the child in its collective character than the individuals that compose it. Like a child it shirks responsibility; like a child, dreaming of gifts from fairy god-mothers, it courts opportunity from fortuitous happenings. It recoils from detail in contentment with generalities, as plainly appears from the fact that it obtains nothing better from the irresponsible press, and demands nothing conclusive from official sources. If proof of this were demanded it might be found in the fact that man has not yet reached a stage of development where he is willing to face the needs set forth in the national budget and provide for them as the manufacturer would provide for his pay-roll. The indirect tax is perhaps a necessary expedient in the present state of the world's political evolution; but it is iniquitous in principle; it demonstrates a preference for the dark instead of the light, in which more readily breed the microbes of corruption.

A better example of haphazard unscientific legislation could not be found than the tariff. Every item has been placed on the list in deference to the wishes of interested groups of men. Analysis there has been none; the investigation by committees has consisted in taking ex parte testimony, not in thorough determination of costs and conditions of production such as a man would deem necessary in his own business. In all countries and in all times protective tariffs have been unscientific. They have protected only one party to the contract by absolutely prohibiting foreign competition. In the days of 'good Queen Bess' they were more honest about it than we. The copper industry of Great Britain was encouraged

by a law that fixed the penalty of death for importing that metal in any form. It was drastic, but effective; it was unblushingly barbarous in its grim threats against competition; it was, of course, barbarous in its disregard of the principle that protection may foster industry without abandoning the people to monopolistic robbery. There is a balance to be struck between the benefit that a protected industry affords to the commonwealth through providing a market for materials and work for otherwise idle hands, and the compensation the public may justly grant in the form of enhanced price under cover of a customs duty for the article produced. To sift the facts regarding costs of production in different countries, and the average costs of distribution, to weigh the value to the community of the industries that protection would create, and to fix a tariff giving an advantage commensurate with this estimated return, would be scientific; it would be business-like; it is feasible.

Mr. Taft is committed by his utterances during the presidential campaign to a thorough investigation of the schedules, with the avowed purpose of reducing those found to be excessive. If the tariff fortifications are shaken by a few more bombs like the one just exploded by Mr. Carnegie the country will become so insistent upon tariff revision that Mr. Cannon and all the Trust-guardians on the Ways and Means Committee cannot prevent an exciting congressional session. Mr. Carnegie has tardily announced, what has long been an open secret, that steel is produced in America today more cheaply than elsewhere in the world, and that even the labor-cost per ton is lower, despite the higher wages paid. Thus has the workman become more than ever the mere brain for directing wonderful mechanisms, displacing the labor of a multitude of hands. Meanwhile the Ways and Means Committee is giving audience to an army of petitioners for increase of duties. The sugar producers never find the tariff quite sweet enough; this hunger is so great as to make proselytes of Louisiana Democrats; it promotes a love-feast at which widely separated and strangely discordant interests sit complacently as fellow-banqueters. The cotton manufacturers of New England and of the Southern States have been at war for years. The New England gentlemen have been zealous in detecting the mote of child-labor in the eye of their brother cotton-spinners of the South, and there has been exchange of uncomplimentary remarks concerning their respective moral attitudes, but when it comes to the tariff they are in sweet accord. Mr. F. E. Lippitt, of Providence, Rhode Island, and Mr. E. E. Tompkins, of Charlotte, North Carolina, voice the unanimous opinion of the American Cotton Manufacturers' Association, that the duty on cotton cloth must be retained, and that the rates on cotton yarns should be increased. We are even told that cotton-manufacture is still an infant industry in the United States. On the other hand, the soap manufacturers are besieging the Committee with demonstrations of the iniquity of the duty on tallow, cocoa-nut oil, soda ash, and other alkalis, clamoring for what we may call rear-end protection.

Manifestly an investigation of the schedules in this manner can lead to no effective remedies. The uncertainties introduced are detrimental to business in high degree. That is why the mass of voters is content to suffer iniquitous tariffs so long. The disaster incident upon a great upheaval of revision makes the country prefer the evils that we have rather than fly to those of which we know not. This is all because the method is irrational, unscientific. Mr. Carnegie would have helped forward true reform more effectively had he insisted upon the application of a sliding scale of custom duties, under control of a permanent commission. By his showing, the operation of such a system would extinguish the duty on iron and steel, while the industry would remain impregnable. A rational administration of the tariff would have no terrors; it would not involve the extremities of life and death for business enterprise; it would not unsettle industry as haphazard revision must inevitably do.

There can be no argument against the establishment of a permanent tariff commission except that it will lead to systematization, and lessen the power of a few to absorb the earnings of the many. Had not the people been so steeped in reverence for the traditions of whimsical government the demand for rational methods would long ago have displaced such an anachronism as our present tariff-blight upon an intelligent nation. Democracy has perpetuated a principle of imperialism, substituting the will of the people for the will of the autocrat. It takes time to reach the elevated plane where the reason of the people shall govern through the application of wise scientific methods. The work of the Interstate Commerce Commission has shown the possibilities of permanent organized effort to control delicate and difficult affairs by adjustment responsive to varying conditions, and has demonstrated the gain to the public in such procedure over reliance upon occasional patch-work legislation. From this the extension of the idea to the tariff is a natural step. No protective tariff is correct in principle or in application that does not benefit the entire community; manifestly a rigid tariff schedule, despite annual tinkering to repair it, can not fit the needs of a progressive nation. It must be subject to modification in respect to altering circumstances under the law of supply and demand at home and abroad, and such flexibility can be given only through a well organized bureau under control of a representative commission with plenary powers.

The question between the policies of protection and free-trade need not influence the discussion of a practical mechanism for dealing with the concrete problem. A country as vast as the United States, and yielding so wide a range of products as to make it a little world in itself, will not speedily throw wide its gates. But we need protection not only against the evil features of a Trust-generating tariff, but against the disturbance of reckless revision. It is time to modernize even the tariff, to make it a rational instrument, administered in a systematic scientific manner, in the interest of all the people—as it can be.

BY THE WAY.

The President in his message to Congress depicts the evils of deforestation graphically, as follows:

There are small sections of our own country, in the East and in the West, in the Adirondacks, the White mountains, and the Appalachians, and in the Rocky Mountains, where we can already see for ourselves the damage in the shape of permanent injury to the soil and the river systems which comes from reckless deforestation. It matters not whether this deforestation is due to the actual reckless cutting of timber, to the fires that inevitably follow such reckless cutting of timber, or to reckless and uncontrolled grazing, especially by the great migratory bands of sheep, the unchecked wandering of which over the country means destruction to forests and disaster to the small home makers, the settlers of limited means.

Thanks to our own recklessness in the use of our splendid forests, we have already crossed the verge of a timber famine in this country, and no measure that we now take can, at least for many years, undo the mischief that has already been done. But we can prevent further mischief being done; and it would be in the highest degree reprehensible to let any consideration of temporary convenience or temporary cost interfere with such action, especially as regards the national forests, which the nation can now, at this very moment, control.

All serious students of the question are aware of the great damage that has been done in the Mediterranean countries of Europe, Asia, and Africa by deforestation. The similar damage that has been done in eastern Asia is less well known. A recent investigation into the conditions in north China by Frank N. Meyer, of the bureau of plant industry of the United States Department of Agriculture, has incidentally furnished in very striking fashion proof of the ruin that comes from reckless deforestation. Not many centuries ago the country of northern China was one of the most fertile and beautiful spots in the entire world, and was heavily forested. We know this not only from the old Chinese records, but from the accounts given by the traveler, Marco Polo. He, for instance, mentions that in visiting the Provinces of Shansi and Shensi he observed many plantations of mulberry trees. Now there is hardly a single mulberry tree in either of these provinces, and the culture of the silk worm has moved farther south to regions of atmospheric moisture. As an illustration of the complete change in the rivers, we may take Polo's statement that a certain river, the Hun Ho, was so large and deep that merchants ascended it from the sea in heavily laden boats; today this river is simply a broad sandy bed, with shallow, rapid currents wandering hither and thither across it, absolutely unnavigable. But we do not have to depend upon written records. The dry wells and the wells with water far below the former watermark, bear testimony to the good days of the past and the evil days of the present. Wherever the native vegetation has been allowed to remain, as, for instance, here and there around a sacred temple or imperial burying ground, there are still huge trees and tangled jungle, fragments of the glorious ancient forests. The thick, matted forest growth formerly covered the mountains to their summits. All natural factors favored this dense forest growth, and as long as it was permitted to exist the plains at the foot of the mountains were among the most fertile on the globe, and the whole country was a garden.

Ruthless destruction of the forests in northern China has brought about, or has aided in bringing about, desolation, just as the destruction of the forests in central Asia aids in bringing ruin to the once rich central Asian cities; just as the destruction of the forests in northern Africa helped toward the ruin of a region that was a fertile granary in Roman days. Short-sighted man, whether barbaric, semi-civilized, or what he mistakenly regards as fully civilized, when he has destroyed the forests, has rendered certain the ultimate destruction of the land itself. In northern China not only have the forests been destroyed, but because of their destruction the soil has been washed off the naked rock. The terrible consequence is that it is impossible now to undo the damage. Many centuries would have to pass before soil would again collect, or could be made to collect, in sufficient quantity once more to support the old-time forest growth. In consequence the Mongol desert is practically extending eastward over northern China. The climate has changed and is still changing. It has changed even within the last half century, as the work of tree destruction has been consummated.

That everything dries out faster than formerly is shown by the fact that the level of the wells all over the land has sunk perceptibly, many of them having become totally dry. In addition to the resulting agricultural distress, the watercourses have changed. Formerly they were narrow and deep with an abundance of clear water the year round; for the roots and humus of the forests caught the rainwater and let it escape by slow, regular seepage. They have now become broad, shallow stream beds, in which muddy water trickles in slender currents during the dry seasons, while when it rains there are freshets and roaring muddy torrents that come tearing down, bringing disaster and destruction everywhere. They wash away or cover in the valleys soil which took tens of thousands of years for nature to form.

In northern China this disastrous process has gone on so long and has proceeded so far that no complete remedy could be applied. There are certain mountains in China from which the soil is gone so utterly that only the slow action of the ages could again restore it.

What has thus happened in northern China, what has happened in central Asia, in Palestine, in north Africa, in parts of the Mediterranean countries of Europe, will surely happen in our country if we do not exercise that wise forethought which should be one of the chief marks of any people calling itself civilized. Nothing should be permitted to stand in the way of the preservation of the forests, and it is criminal to permit individuals to purchase a little gain for themselves through the destruction of forests when this destruction is fatal to the well being of the whole country in the future.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

R. T. Bayliss is at El Oro.

Hiram W. Hixon is in London.

W. Pellew-Harvey is on his way to Australia.

James T. Dixon has returned to England from Siberia.

Howard W. DuBois is examining copper mines in Nevada.

Claude Vautin has an office at 730 Salisbury House, London.

Jesse J. MacDonald is with the American Trading Co., at London.

Thos. H. Leggett and Fred. Hellmann are here from New York.

Thomas D. Murphy was recently at El Oro, and is now in Costa Rica.

D. H. Harroun, of Mexico City, was recently in the territory of Tepic.

W. L. Benedict is expected in San Francisco shortly. He is now in Arizona.

R. H. Burrows, of Guanajuato, is professionally engaged at Pachuca, Mexico.

Edward L. Dufourcq, of New York, is in San Francisco, on his way to Nevada.

D. E. Blake sails on December 11 from San Francisco for the Philippine Islands.

Falcon Joslin, president of the Tanana Valley Railroad Co., has gone to New York.

A. G. Suydham is superintendent of the San Roberto mine, at Zacatecas, Mexico.

C. W. Purington leaves London on December 12 for a short visit to the United States.

S. E. Robbins, formerly at the Fremont mine, in Amador, California, is now in Costa Rica.

A. B. Emery represents the American Smelters Securities Corporation at Velardeña, Mexico.

Robert Hawkshurst, Jr., has completed the examination of the Santa Jovitas copper mines, in Chile.

Cecil Pocock has been appointed general manager of the Montezuma mines, in Costa Rica.

F. H. Clark, manager of the San Cayetano mines, Guanajuato, Mexico, has gone to New York.

C. C. Schnatterbeck has resigned as associate editor of the *Mining World*, and is now at Baltimore.

E. A. Strout is superintendent for the Guanajuato Development Co., succeeding John Butler, who resigned.

Allen & Colburn, of Denver, have completed the examination of copper claims in Grand county, Colorado.

Hugh Rose, general superintendent for the Guanajuato Development Co., has returned to Guanajuato, Mexico, from New York.

L. D. Mills is at Guanajuato, in the interest of C. W. Merrill, of San Francisco, making experiments with the Merrill precipitation press.

Jos. L. Danziger, formerly of the department of chemistry, in Columbia University, has been appointed manager for the Canadian Behrend Dry Concentrator Company.

John P. Cosgro, mechanical superintendent for the American Smelters Securities Co., has tendered his resignation. Mr. Cosgro is at present at the Flat River plant of the Federal Lead Company.

E. C. Trask, general foreman of the Yampa smelter, and C. L. Kraemer, chemist at the same plant, resigned on December 1 to engage in the coal business at Salt Lake City, under the firm name of the Wasatch Supply Company.

The special three-months course for mining men begins its eleventh annual session at the School of Mines of the University of Washington, at Seattle, on January 5.

Latest Market Reports.

LOCAL METAL PRICES—December 10.

Antimony	12@16c	Quicksilver (flask)	$45@46
Casting Copper (scrap)	8¼@13½c	Spelter	6¼@7c
Pig Lead	4.55@5.50c	Tin	32@33½c

ANGLO-AMERICAN SHARES.
Cabled from London.

	Dec. 3. £. s. d.	Dec. 10. £. s. d.
Camp Bird	0 16 0	0 16 6
El Oro	1 6 3	1 6 10½
Esperanza	3 2 6	3 1 3
Dolores	1 10 0	1 10 0
Oroville Dredging	0 7 6	0 8 0
Stratton's Independence	0 2 6	0 2 6
Tomboy	1 0 0	1 0 7½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Nov. 27	14.18	4.27	5 12	48½
" 28	14.18	4 27	5.12	48
" 29	Sunday.	No market.		
" 30	14.18	4.27	5.12	48⅜
Dec. 1	14.18	4.27	5.12	47⅞
" 2	14.18	4.27	5.12	47⅝
" 3	14.18	4.27	5.12	48¼
" 4	14.18	4.27	5.13	48
" 5	14.18	4.27	5.13	48⅜
" 6	Sunday.	No market.		
" 7	14.18	4.27	5.13	48½
" 8	14.12	4.25	5.13	48⅜
" 9	14.06	4.25	5.13	49
" 10	14.06	4.25	5.13	49¼

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Dec. 3.	Dec. 10.
Amalgamated Copper	83½	84½
American Smelting & Refining Co	92	92⅜
Boston Copper	16	16¼
Butte Coalition	27	27⅜
Cumberland Ely	8	8
Dolores	7½	7½
El Rayo	4	3⅞
Giroux	6¼	6½
Greene-Cananea	11	11
Indiana Sonora	4⅞	4½
La Rose	6⅝	6¾
Miami Copper	12⅝	12½
Nevada Consolidated	19⅛	20½
Newhouse	6	6⅛
Nipissing	10⅛	10½
Ohio Copper	5½	5½
Tennessee Copper	44¼	45
Utah Copper	48	48
Yukon	4⅝	4¾

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, December 10.

Atlanta	$ 16	Laguna	$ 1.30
Belmont	91	MacNamara	36
Booth	23	Manhattan Con	6
Columbia Mtn	18	Midway	20
Combination Fraction	1.42	Montana Tonopah	85
Daisy	80	Nevada Hills	1.70
Fairview Eagle	35	Rawhide Queen	70
Florence	4.70	Sandstorm	20
Gold Bar (Bullfrog)	2	Silver Pick	11
Goldfield Con	8.90	St. Ives	20
Gold Kewenas	26	Tonopah Extension	60
Great Bend	27	Tonopah of Nevada	6.75
Jim Butler	17	Tramp Con	10
Jumbo Extension	22	West End	33

(By courtesy of W. C. Ralston, 353 Bush St.)

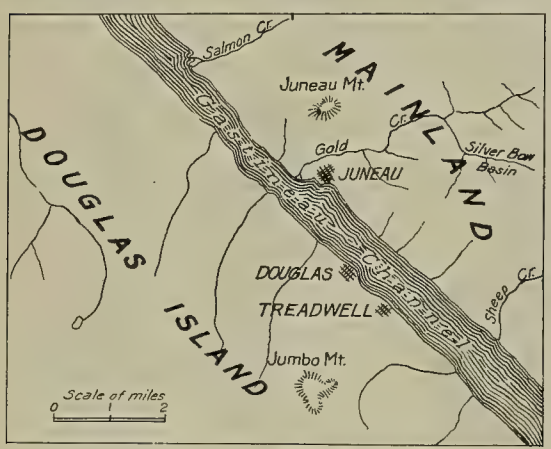
COPPER SHARES—BOSTON.

	Closing prices. December 10.		Closing prices. December 10.
Adventure	9¼	Mohawk	70
Ahmeek	120	Nevada Con	20½
Allouez	39	North Butte	86
Amalgamated	84¾	Old Dominion	68¼
Arcadian	3½	Osceola	132
Atlantic	17⅞	Parrot	30¼
Boston Con	16⅜	Quincy	96
Butte Coalition	27½	Rhode Island	5¾
Calumet & Arizona	119	Santa Fe	2½
Calumet & Hecla	675	Shannon	17¾
Centennial	34	Superior & Pittsburg	18
Copper Range	81¼	Tamarack	83
Daly-West	10⅝	Trinity	17¾
Franklin	17½	United Copper Con	
Granby	104	Utah Copper	47
Greene-Cananea, ctf	11	Victoria	9½
Isle Royale	24	Winona	6½
Mass	6⅞	Wolverine	150

General Mining News.

ALASKA.

The Eagle River Mining Co. is operating with 70 men and is supplying ore to the 20-stamp mill crushing 75 tons per day. The concentrate goes to Tacoma. Work will proceed throughout the winter. B. L. Thane is manager.——New and promising mineral discoveries on McLean's arm, on the southeastern side of the Prince of Wales island, have caused considerable activity. W. A. Thompson has exposed a large orebody on Mallard bay, one and a half miles south of McLean's arm, which contains copper, gold, and silver, the lowest assay showing a total of $12. Ickis & Polson are driving an adit on the arm which is now in 75 ft. and is said to show a good orebody.——Reports from Juneau state that a discovery of very rich quartz ore has been made near Auk bay, which is at the western end of Gastineau channel. The prospectors who made the find are Victor Spaulding, Perry Wylie, and John Childs, the latter better known as Saltwater Jack. The find was made on the southern slope of a ridge running from the mainland out toward the upper end of Douglas island, and distant from Juneau about eight miles, in a westerly direction. The gold was all panned, as the quartz in which it occurs has been badly decomposed. It is probable that a big rush will result as soon as the snow has disappeared.



Juneau District, Alaska.

Auk Bay is just beyond the limits of this map, at the upper left-hand corner.

ARIZONA.

GILA COUNTY.

The Live Oak property, a short distance west of Globe, has been bonded to H. R. Hovland, of Duluth, president of the Con. Copper Co. The price is said to be nearly half a million dollars and the term of the contract is two years. The orebody is opened by two shafts, neither of them deeper than 150 ft., and by several adits and open-cuts. In one of the shafts sulphide ore has been cut, and it is the opinion of mining experts who have examined the property that with deep development it should make one of the big mines of the district.

MOHAVE COUNTY.

J. T. Davis, of San Francisco, who has a bond on the Midnight mine in the Chloride district, expects to equip the property with a milling plant.——The Tawa Development Co. will probably start development on the Gold Giant and other claims in the Cottonwood district.——J. A. Elway is sinking a shaft on his claim at the Gross ranch, near Cerbat.——J. D. Jordan, who has had a bond on the Gold Crown group of mines in the Union Pass district, has transferred his option to Dan S. Richards. The mines are owned by O. D. M. Gaddis and Dr. W. E. Sauls. It is the intention of Mr. Richards and associates to begin active work on the mines within the next month and is now getting things in shape to start a camp at the mines.——A strike has been made on the Holy Moses mine, owned by A. L. McKesson about seven miles south of Kingman. At a depth of 63 ft., five feet of rich milling ore has been cut, but owing to the inflow of water and lack of machinery to handle it, work had to be stopped until a hoist can be put on. For a month past Mr. McKesson has been running his little mill one hour a day on ore from the shaft, which nets about $35 per ton on the plates. Drifts have been run on the vein some distance from the shaft and fine ore found. As soon as a hoist is put in the shaft will be sunk 100 ft. farther.

PINAL COUNTY.

As work progresses on Woodbury & Lobb's new copper discovery, about 25 miles north of Florence, in the foothills of the Superstition mountains, the prospects are more encouraging.

CALIFORNIA.

INYO COUNTY.

T. L. Oddie, of Tonopah, has taken a bond on the Jim Wright property in the White mountains, 12 miles from Big Pine. Six men are now at work and the ore is to be shipped to the smelter at Keeler. The lease and bond requires the sinking of 160 ft. in the present shaft, and a certain amount of cross-cutting.——Recent developments in the McAfee & Logan lease on the Cady property east of Big Pine, have resulted in arrangements for more extensive development in the immediate future. In preparation for the work which is to be done during the winter, a large amount of supplies have already been shipped to the camp to avoid any delay during the winter months in case the bad weather should make it impractical to come out. About six tons of ore is already on the dump, sacked ready for shipment. This ore has been carefully sampled and assayed and averages well over $100 per ton.——The Goldfield lessees, Stevens & Horn, have taken a lease on the old Montezuma mine and expects to be starting regular shipments to the smelter at Keeler before the end of the year. The Montezuma, which has yielded some of the richest silver ore in the district, is in the foothills of the White mountains a few miles distant from Big Pine.

MARIPOSA COUNTY.

The Kolbak mine on Saxon creek is getting ready for business. A Huntington mill and lumber have been purchased and the company expects to have everything in running order at an early date.——The Moonlight mine, on the North Fork of the Merced river, owned by R. B. Stolder and Dan Wagner, was sold last week to Samuel Harris, who is working a group of mines adjoining the Moonlight. The sum paid has not been made public.——More stamps are needed at the Mariposa mine, as the present number is insufficient to work the amount of ore being taken out by the several lessees. Manager Maguire says he will add five or ten more stamps as soon as possible.

PLACER COUNTY.

Six men are doing work at the Big Gun at Michigan bluff, preparatory to working the mine this winter. This is one of the famous hydraulic mines of the county. It formerly belonged to the Van Emans, but the largest part is now owned by Alfred Dixon. It is reported that he has made a deal with W. S. Fletcher, who intends to work it this winter.——The slope at the old Whitefield claim at Last Chance has been sunk 80 ft. in the expectation of striking the old slab channel. A surprise awaited the company, as instead of the slab, a new channel was opened up. There is but little washed gravel in the new channel, but it carries heavy fine gold. Twenty men are employed.——The mill at the Peckham hill has been finished, the boiler installed, and the adit nearly cleaned out preparatory to regular work.

SHASTA COUNTY.

The breaking of a new cable in the incline shaft at the Balaklala mine was the cause of the death of an Italian miner. The cable showed no flaws and the cause of the break is inexplicable.——E. J. McLaggan has finished the

assessment work on the Michigan and McClune groups of copper claims, the work being done by the creditors of the Phoenix Securities Co.——The oil excitement in Anderson has subsided, as a big flow of water was struck at Shade farm at a depth of 200 ft. and operations ceased. The well-boring outfit is now at work sinking on the big well of the Anderson Water Company.

SIERRA COUNTY.

Alex Dobbie and A. C. Widber are doing the assessment work on the Australia lode claim, in Slug canyon, one mile south of Downieville. The claim is owned by Richard Phelan.——Frank P. Roddy is doing the assessment work on the Last Resort claim on the hill back of Hansen's ranch.

SISKIYOU COUNTY.

R. A. Murray and his associates expect to operate the Finley placer mine at Sawyers Bar during the winter and are now engaged in preliminary arrangements.——A company of Chicago men has purchased the group of quartz claims on Taylor creek belonging to Harris Bros. for $70,000. Taylor creek is a tributary of Salmon river. The new owners will begin operations at once.——Dan Spear and others are doing assessment work on the King Solomon group of mines for the Canyon Mountain Mining Co.——W. A. Cooper, of Eureka, has re-bonded the Coborn hydraulic claims on Cecil creek, near Yreka, and intends to start operations as soon as the season opens.——The Happy Camp placer property was sold at sheriff's sale recently. The Happy Camp is one of the most valuable properties in the county, consisting of several hundred acres of ground, mostly patented, as well as valuable water rights and mining machinery. It was owned by the Oregon Gold Mining & Water Power Co., which spent about $200,000 in development and equipment. It had not been worked for several years. Reeves Davis, of San Francisco, was the purchaser, the price being $10,500.

TRINITY COUNTY.

Paul Gein was washed down the full length of the 3600-ft. LaGrange flume one day last week and not only lives, but escaped without a broken bone. He was at work repairing the flume when the water was turned in unexpectedly and he was carried along with the boulders and gravel by the mighty flow of 6000 inches and shot over the rock pile at the end of the sluice. His escape from drowning is no less marvelous than the fact that he was not crushed to death.

TUOLUMNE COUNTY.

Arrangements have been perfected to begin extensive operations at the Black Oak as soon as water is furnished for the mill. Seventy men will be employed.——The stamps in the mill at the Mack, at Big Oak Flat, began crushing a good quality of ore last week.——Want of fuel has forced a suspension of operations at the Wild Cat.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Argentine Exploration Co. has been organized with a capitalization of $1,000,000, shares having a par value of $1 each. Development has been put under way upon the Morning Star lodes No. 1, 2, 3, and 4, situated in West Argentine, near the base of Gray's and Torrey's peaks. In running an adit 40 ft. a vein was intersected, a streak of ore being exposed that is 18 in. wide and carries $47 per ton in silver and lead. A plant of machinery will be installed in the early spring. B. J. Martelon has been appointed manager.——The Reo M. Co. has filed articles of incorporation with a capital stock of $250,000, shares having a par value of $1 each. Work has been started in the development of the Martelon and Mitchell lode claims, up Cherokee gulch between Sherman and Republican Mtn. An adit has been run 400 ft., but it will be necessary to drive 125 ft. before the Martelon vein will be reached. Thomas Cudahy has been named as manager.——A campaign of development is to be started at the holdings of the Georgetown M. P. & T. T. Co., on Columbia Mtn. A contract has been made with the Sigafoos boring machine whereby the manufacturers are to be given two weeks in which to get the machinery to this camp. Two weeks will be allowed for the installation; two weeks to make the tests, and if at the end of that time the machine will not do the work claimed for it, two weeks will be given in which to dismantle. The Company has entered into contracts with 70 owners of mines on Columbia, Democrat, Republican, and Sherman Mtn. for development work as soon as the veins have been intersected. In the event a vein is passed and the owner does not at once start work, the tunnel company will develop at a royalty of 15%. The bore is to be driven 4000 ft. west through Columbia, after which it will be headed due south through Democrat, Republican, and Sherman mountains, having a total length of 16,000 ft. The entire vein system of those localities will be intersected at enormous depths. It is reported that ample funds have been subscribed and that a big force of men will be given employment. Samuel McKirahan, of Georgetown, has been appointed manager. Chicago capitalists are financing the enterprise.——The shaft from the adit level, on the Bellevue-Hudson, has now reached a depth of 80 ft. An 18-in. streak of rich silver ore is being followed. Driving is to be started from the 75-ft. station. Owing to a flow of water it became necessary to install a pump last week, and no further trouble from this source will be experienced. The work is being performed under contract by Wing & Jones.——Work on the Culley adit was resumed this week. The bore is to be driven steadily forward for intersecting the series of veins controlled. The first one to be cut is the extension of the Jo Reynolds, which is 150 ft. distant. J. J. Culley, the manager, has returned from New York and states that ample finances have been pledged to insure steady development.——Frank Babcock has been awarded a contract for the driving of the Robert E. Lee adit on McClellan Mtn. an additional 100 ft. This will take the heading past the Poorman's Relief vein, which produced high-grade ore from the shaft workings. The property is owned by the Southern M. & M. Co.——Work has been resumed upon the Narragansett adit, on Sherman Mtn. The bore is in over 1000 ft. and from surveys a vein will be reached within 50 ft.——E. W. Shepard, owner of the Bard Creek tunnel-site, has in process of organization a company for the development of the holdings. A number of claims are owned and it is proposed to drive an adit for the development of them. The property is situated on Lincoln Mtn. and is surrounded by a number of producers.——Plans have been prepared by the Newbury Machine Co., of Denver, for a 250-ton mill to be erected by the Banner Con. M. Co. Electric power will be used. Fred Nye is manager.——Charles Fuller, of Idaho Springs, manager of the Bellman mine, announces the discovery of a 6-in. streak of ore that assays 28 oz. gold and 35 oz. silver. The strike was made 35 ft. from the line of the Newhouse adit.——It is believed that before the first of the year connection will be made with the twelfth level of the Sun and Moon in the three-compartment raise being carried from the Newhouse adit level. This raise has been carried for 1065 ft. R. C. Bonney, of Idaho Springs, is manager.

Georgetown, December 5.

SAN JUAN COUNTY.

G. Hennings and Ludwig Vota have taken a two-year bond and lease on the Tip Top group of 17 claims in Eureka gulch. Active work will begin at once and continue through the winter. A mill to treat the ore is contemplated next summer.——The Hermes group of claims, on the right fork of the Animas, about a half-mile above Animas Forks, has recently been sold by the owners, Philip Newman and W. A. Triplett, to a Denver company, headed by F. D. Fowler, president of the Eldorado Springs Resort Co. The price paid is not stated, but is supposed to be in the neighborhood of $35,000. The new owners have let a contract to Mr. Triplett for extending the adit another 250 ft., and the work is progressing satisfactorily. This adit, at a distance of about 100 ft. from the portal, has cut an orebody 12 in. wide which assays between 2 and 3 oz. in gold and also

carries silver and copper.——The Danville M. & M. Co., under the management of Martin Houk, is making excellent headway on its lease on the Shenandoah. One carload of high-grade ore has already been shipped and another will be ready soon. The management is not planning to make any more shipments this fall, but will go ahead with development throughout the winter and will have a large amount of shipping ore on hand when the trails are open in the spring. The property is being worked through the Trilby tunnel, the property of the Trilby Mining Company.

LAKE COUNTY.

Arrangements are being made to install a plant of machinery on the Gallagher property on Yankee hill, which was recently taken under lease by a number of local mining men. A hoist is now being installed.——William Harvey and associates, who are working the Result property, have recently opened a good body of iron ore, from which they expect to start shipping in a short time. The best of it runs about five ounces silver and a heavy excess in iron. ——Arrangements have been made to increase the output and also the force of men on the Hilltop property in the Horseshoe district, which is now being operated by W. F. B. Berger. The Colorado & Southern switch which connects with the Hilltop from Leavick is being improved, preparatory to handling the increased tonnage. As soon as the necessary preliminaries are complied with, the Hilltop will be shipping about 200 tons per day, the output consisting chiefly of a low-grade zinc ore, most of which goes to the smelters in Kansas.——S. P. Fenton received the machinery last week for the B. P. Mining Co.'s shaft on the Buffalo President property on Rock hill. He is busily at work getting it in place and hopes to have everything connected up and ready for sinking by the first of the year. Electrical power will be used exclusively and the line is already in place.

OURAY COUNTY.

The foundations for the 10-stamp mill being built by the Torpedo-Eclipse are completed and part of the frame-work is up. Andrew Wallace, of Montrose, is in charge of the erection.——Work was started this week on the Calliope north of Ouray under the direction of Tim Manion, who will have charge of the operations to be undertaken. It is controlled by the Calliope Tunnel & Mines Co., which was organized about a year ago. The company is financed by Eastern parties, and is reported to have sufficient means at its diposal to drive the adit to its completion. At present a force of about 25 men will be at work.

SUMMIT COUNTY.

The American Zinc Extraction Co., of Leadville, has completed the overhauling of the Little Sallie Barber property, and is now planning to operate it extensively. The mine is a heavy zinc producer, and the product will be shipped to the plant of the company at Leadville.——The Colorado & Southern reports a heavier tonnage from the Kokomo district during the past month than they have hauled out of that place during the same length of time in several years. A number of large mines there are getting on the shipping list.

TELLER COUNTY.

The shaft on the Laura Lee claim on Mineral hill has been unwatered and sinking has been resumed. The shaft, now 130 ft. deep, is to be carried down to the 250-ft. level before any further lateral work is attempted and the equipment, now consisting of a horse-whim, is shortly to be replaced by a modern mine plant. George F. Brittain, who holds a lease and bond on the property, has interested Eastern capital in the venture and a mining company, to be incorporated under the name of the New Pearl Gold Mining Co., is in course of organization.——A two years' lease, expiring January 1, 1910, has been secured by James M. Wright, president and general manager of the Joe Dandy Mines Co., on the main shaft and workings of the Eclipse mine and territory adjacent thereto on Battle and Squaw Mtn., owned by the Keener Gold Mining Co.——Joseph Brentlinger and associates holding the lease on the main shaft and workings on the Old Gold Mines Co.'s property on the western slope of Beacon hill will install an electrically driven compressor and operate on a more extensive scale with the use of hammer drills. A promising orebody has been exposed west of the shaft at the 250-ft. level and the lease is already on a paying basis.——Philip Argall, of Denver, consulting engineer of Stratton's Independence Limited and the designer and manager of the new cyanide mill of that corporation, is authority for the statement that the new plant will be treating ore by January 4.——The mill, ore-house, and shaft-building of the Jo Dandy Mining Co. burned last week, the total loss being about $100,000, on which there was about $45,000 insurance. The origin of the fire is unknown. The plant will be re-built at once.

IDAHO.

IDAHO COUNTY.

(Special Correspondence).—The Ohadi M. & M. Co., which owns a number of claims in the Cave Gulch district, has ordered supplies sent up the river by one of the early boats and will do 600 ft. of development this winter. This is the first time steamboats have plied the Upper Snake successfully and it will have much to do with the development of numerous prospects in the district.——The Peacock mine has been financed and, it is reported, will soon commence the erection of a tramway to carry its ores to the railway. The mine was formerly a shipper, but has been closed for a year or more.——The United Placers Co., which is now about to secure patents to 1100 acres of ground, is planning an extensive flume and power line, work on which will begin this winter. The flume will be eight miles long. A power transmission line 14 miles long will furnish power to the mine. The work will be pushed all next summer and it is hoped to be mining by November.——The Idlewilde Mining Co., which owns a group of five claims near Elk City, has purchased supplies for immediate shipment to the mine, and will start winter development at once. A 400-ft. adit is being driven to tap the ore at the intersection of two veins and at a depth of 250 ft. Over 60 ft. of the work is now completed. When the ore is reached drifts will be run in four directions to explore each vein.——The Crackerjack mine is being worked by lessees, who are now employing 15 men. The stamp-mill is shut down until enough ore is on the dump to keep it running for several months. Supplies are being sent in for the winter.——A four days' run of the five-stamp mill on the Espey property at Newsome has given a gross clean-up of $5400. Supplies and some repairs have been purchased and sent in. The mill will at once resume and will run for a portion of the winter at least.

Elk City, November 27.

SHOSHONE COUNTY.

(Special Correspondence).—The affairs of the Amador Copper & Gold M. & M. Co. still continue to occupy the limelight of the mining industry of the Coeur d'Alene. A visit made to the mine during the week by three of the leading officers of the Company, as it is at present organized, and a lengthy report made of the showing in every level. A copy of this report has been issued to the stockholders, together with an offer on the part of the officers that they will be glad to pay all expenses of a visit to the mine of any doubting stockholders, provided that if the report be true the visitors will pay their own expenses. In addition to this a meeting of the Western stockholders was called in Wallace last Monday and attended by D. E. Mackinnon, as well as many holders from all over the country. The meeting was called more for the purpose of discussing ways and means than anything else, and at the same time to offset the effect of the meeting of Eastern stockholders held in Chicago. After debates lasting several hours, in which the general tone with regard to the future of the property was optimistic, a set of resolutions to the following effect was adopted: The stockholders of the meeting desire to place themselves squarely on record as favorable to the continued management of the property by D. E. Mackinnon, "believing that the success of this

enterprise and our investment is best safeguarded by the man who has never broken a promise to us and who has built up a great enterprise with consummate skill and bulldog tenacity." The stockholders condemn in the severest terms the management of the Amador mine since May 1, 1907, at which time Mr. Mackinnon retired as manager and was succeeded by a management controlled by George Lill and others and since which time the property has been at a standstill. The stockholders conclude by pledging themselves to support all action taken by the present directorate in anything that may forward the interests of the mine.——A rich strike of copper ore has been made in the Ruby group of claims southwesterly from Lookout and about four miles from the Chicago, Milwaukee & St. Paul railroad. The strike was made by Patrick Sullivan and Adam O'Donnell, who uncovered the vein and found it to be a true fissure eight feet wide. At a depth of only 25 ft. an orebody was opened, the lowest assay of which gave returns of $101 gold and 31% copper. Some assays are as high as $121. It is the intention of the owners to work the property as a private corporation and it is

The Coeur d'Alene, Idaho.

believed that shipments of ore will more than meet the expense of development.——Joe Clark, foreman of the Shoshone Concentrating Co.'s mill, at Sweeney, has resigned and will go to take charge of the old Perlew property near Victor.——A contract for 100 ft. of shaft-work at the Bullion property has been let to Larry Ryson. This will take the shaft down to a depth of 300 ft., and if the present indications of improvement continue, the property will be one of the best copper mines in the district.——At a meeting of the board of directors of the Hypotheek Mining Co. held in Wallace it was decided to patent the nine claims of the company and to install a hoist with a capacity of 1000 ft. to replace existing machinery.——A certificate of amendment to the articles of incorporation of the Paragon Mining company has been placed on record by which the name of the company is changed from the Paragon Mining & Manufacturing Co. to the Paragon Consolidated Mining Co. It is also stated that the affairs of the Company are to be entrusted to a board of trustees consisting of not less than seven and not more than nine members.——The machine drills, compressor, and all the other machinery recently purchased by the Liston Mining Co. have now been put in place at the property and work has commenced on the driving of the 2000 ft. adit. A contract for 500 ft. of work will be let about January 1.——A strike of good copper ore has just been made on the property of the Josephine Mining Co., on the Montana side of the State line. This ore was found in the drift from the bottom of a 50-ft. shaft and consists of two feet of clean shipping ore carrying solid chunks of bornite and a large quantity of milling ore. Assays show 14.8% copper, 33.9% lead, 4.2 oz. silver, and $3 gold. A hoisting plant will be installed at once. The property is under bond to Dan McInnis, James McGinnis, George Loop, Forest Frazer, Claus E. Anderson, and C. M. Weller, all of Wallace.

Wallace, December 5.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—With the recent rise in the price of zinc ore a number of plants which have been closed down are planning to resume operations throughout the Missouri-Kansas district. The Isabel and Comet mines at Alba, which have been idle for some time, are beginning to operate again. The Comet is a comparatively new producer, beginning work several months ago, but has stored its ore waiting for higher prices. Its product is said to be among the richest ever taken from the mines in the Alba camp. The Morgan Forty, directly north of Carterville, is active again. This has been among the best producing tracts in that part of the camp.——The 125-ton plant of the Wilson Mining Co., in Spring City, is to be started again after several months' shut-down. The old workings have been abandoned and a new shaft sunk 300 ft. from the mill. A tramway has been built from the shaft to the mill and machinery will be installed for the rougher work, while the finer will be flumed down the tramway to the mill. Two drill-holes show ore, one 8 ft. of galena and the other 11 ft. of zinc blende.——The old Kathleen property in Belville is to be re-opened after a shut-down of several years. The drifts are very small, blindly following the ore trend as it was developed before the general use of heavy timbering. There is still a large amount of ore underlying the lease, as five draws centre there, all rich in ore. It will be operated as soon as drained.——Besides the re-opening of idle leases many companies are extending their developments on leases already active. The Mohler-Smith Co., at Carl Junction, has begun the development of an additional lease. This Company has thoroughly developed several hard leases in this camp and reclaimed a cave-in which seemed disastrous. It is now planning to use a steam-shovel when work is begun in new ground. The new work will double the production. A sub-lessee has recently opened a 30-ft. face of ore which runs 30% zinc-blende.——The Merry Widow Co. has completed the ninth hole on its lease in the Midway camp and has found ore in five holes above the 80-ft. level, and a shaft will be started at once. The Merry Widow is in the vicinity of the Osyka, the Kalitan, and the Florence, which have done extensive development work during the past six months.——Jess Paul and associates, operating a sub-lease upon the Florence tract, have made a rich strike of shallow ore, at 14 ft., and during sinking a large quantity was taken out.——The sheet-ground area west of Joplin is being developed. Two companies have made rich strikes recently. H. E. Gerke has completed a drilling campaign in which runs of ore 25 ft. thick were penetrated. A large amount of development is planned during the coming year. This sheet-ground tract is comparatively new, having been developed during the past year, and is as rich as the famous north Webb City tract. Its development will mean much to the Joplin camp.——The North Kimberley Mining Co. entered the producers list for the first time last week. The shaft has just been completed and five drifts run, all of which struck ore. A 200-ton mill is on the ground. The ground is soft and requires heavy timbering.——The Maple Leaf L. & Z. Co. is sinking a new shaft in the Duenweg district on a lease adjoining the Wolfsheart Co. The shaft is down 40 ft.——Several new milling plants are under con-

struction and will be completed shortly. The Coahuilla Co. at Duenweg is building a 300-ton plant which will soon be producing.——The Montana Mining Co. is building a 200-ton mill upon a lease at Smelter Hill. A 100-ton mill already on the lease is to be removed; only a small portion of the machinery will be used in the new mill. Jones, Wetmore & Hart are completing a 300-ton mill upon a lease of the American Z. L. & S. Co. at Oronogo. The lease is in the old bed of Center creek and during high water the whole vicinity is covered with water. The mill and offices are built on high foundations to prevent overflow. A mill will be built in the Spring City camp by Arthur Scott & Co. A shaft is in ore at 95 ft., although the drill entered ore at 110 ft. The formation is such that the ore cannot be easily cleaned on hand-jigs and a mill will be constructed. A former company abandoned the ground after sinking within a few feet of ore.——The Maude L. mill is to be moved from its present site, in the Chitwood camp, to a lease farther north. Both are owned by Harry Gundling. The work will be completed in 60 days.

Joplin, December 4.

NEVADA.

ESMERALDA COUNTY.

An increased flow of water was encountered a few days ago in the shaft on the Clermont, which is being sunk by the Goldfield Consolidated Mines Co. Another pump has been installed. This shaft is nearing the 800-ft. mark and is now one of the deepest bores in the camp.——A streak of ore, ranging in width from a few inches to two and a half feet, assaying as high as $1080, has been struck on the Ricker lease on the Velvet property, which is part of the holdings of the Goldfield Merger Mines Co.——A strike of pay-ore was made last week on the Sure Thing claim of the Brown Bonanza group, 10 miles south of Goldfield. The find was made while doing assessment work. The owners are so encouraged that they intend to develop the property extensively.——It is said that the management of the Big 4 lease at Rawhide will erect a small mill.

HUMBOLDT COUNTY.

Summerfield & Pearce's teams are hauling in a carload of 15 tons of high-grade ore from the Kennedy and Benton mines, at Kennedy. As soon as it has all been brought in, the ore will be shipped to the Selby smelter, and it is expected that the shipment will net fully $100 per ton.—— W. J. Smith and associates, of San Francisco, have purchased the property of the Gold Prize Mining Co. in the Seven Troughs district. An adit will be started at once and later on machinery will be purchased and a shaft sunk.

LINCOLN COUNTY.

George P. Spittall announces that the Nevada-Victor Co. will erect a 10-stamp mill on its property in the Crescent district. The machinery has been purchased and is expected to arrive within 30 days. The plant will treat the ore from the Black Rock and the Hillside mines and will also do custom work.

LYON COUNTY.

The Utah-Yerington Mining Co. has settled the litigation which has been going on for the past two years, and has acquired the equity of the Home Bee in all property in litigation. The settlement was on a stock basis, the amount given not being made public. The settlement was brought about through the efforts of A. G. Gutheil, who has been at work on the matter for some time.

NYE COUNTY.

A number of Eastern people have secured the Canyon mill at Manhattan and have made a substantial payment on the property. The Thanksgiving company is preparing to have 1000 tons of ore run through the mill. A small portion has already been treated and the returns are more than satisfactory.——G. S. Johnson and S. C. Burr are authority for the statement that the Round Mountain Central Mining Co. will begin operations at once. It is proposed to sink a shaft near the Fairview and Daisy line and a hoist and head-frame have been purchased.——The Nevada-California Power Co. has completed three of its power units, aggregating 10,000 kw., or practically 23,000 hp. The material to extend the line from Millers to Manhattan and Round Mountain has been purchased and work on the surveys is now under way. The line from Millers to the sub-station, which will be built at Central, two miles west of Manhattan, will carry the full capacity of the generating plant at Bishop. The voltage on this line to the sub-station will be 60,000, where it will be reduced to 11,000 volts and transmitted to Manhattan and Round Mountain. It is expected that power will be available at these places by April 1.——Work on the Big Ten group, 18 miles southeast of Manhattan has closed down for the winter. George LeDuke, who is manager, reports having opened up a 12-ft. vein of milling ore on the Big Ten No. 1, besides three other smaller veins. A Chicago company, under the management of Judge Mellin, which has been developing a group of claims near the Big Ten, has also closed down for the winter.——The total output of the Tonopah mines, for the week ending December 5, was 5411 tons, of an estimated value of $135,275.

CANADA.

BRITISH COLUMBIA.

The Keremeos Copper Co., owned by Spokane men, has let a contract of 100 ft. of adit to be driven on one of its three claims, near Keremeos, in the Similkameen. The Company, which is headed by Dan Schultz as president, has been developing the claims for several years, and now has 1500 ft. of underground work done.——A 500-ft. adit is to be driven to tap several known veins on the Bell Mining Co.'s properties on the Wallace Mtn. The veins carry ore in paying quantities on the surface, and the intention is to tap the leads at a depth of 200 ft.

YUKON TERRITORY.

All Gold creek is among the creeks being worked this winter. The stream has received more or less attention since '98, and a large number of men have been there at various times taking out the pay. Bob Smith and partner are working on All Gold this winter at the mouth of Lucky. McConaghy and partners have been working All Gold hillsides for several seasons, and have a hydraulic proposition of much promise. It is said that they can get as much as 40c. per square foot of bedrock. They have 10 acres of ground.——Dave Ennis, on No. 6 Gold Run, kept working and washing gravel on the top of the ground this year until October 20. This is an exceptionally late date to wash.——Nels Boyd and Jepperson, owners of 82 Below on Sulphur, are planning to install their new steel conveyor there in March, and then to start working and washing the gravels underground by hydraulic process.—— The ground on 82 is 28 ft. deep, and there is four feet of gravel. The new method is to hydraulick out the gravel, conduct it through sluice boxes underground, and convey the tailing to the surface. Several men required in the past to shovel in will be eliminated.——The four drills on the Boyle concession, owned by the Canadian Klondike Mining Co., which operates what is known as the Bear Creek dredge, have been shut down for the past season. The company has not announced its intention of bringing in any more dredges immediately, but has kept plugging away over the concession the last season with the four Keystones. This style of drill has been used successfully on the concession for years, and the drills have been a great factor in finding the paystreak ahead of the dredge, thus avoiding the working of worthless ground.——Forty-five men are engaged putting the Bear Creek dredge into condition for work next spring. The hull is being strengthened and given a general overhauling. The dredge lies in a slough at the edge of the Klondike about a mile below the mouth of Bear, to which place it has followed the pay streak in general work the last three seasons. The dredge started work the middle of August 1905 and has worked continuously through every season since, accomplishing this year the phenomenal record of running until November 9, and then having to shut down only because of the exhaustion of the fuel supply.

Special Correspondence.

LONDON.

Caucasus Copper.—Magnetic Concentration.—Definition of Mineral.—Copper in Siberia.

The Caucasus Copper Co. is an enterprise that was started eight years ago for the purpose of developing some extensive copper properties in the south of Russia close to the boundary of Asia Minor. The enterprise was taken up by a number of influential London merchants conjointly with the London representatives of J. P. Morgan & Co. There is no doubt that the copper deposits are extensive, but the trouble is that they are low-grade, silicious, and friable, so that concentration has proved difficult. At one time raw smelting was tried, with disastrous results, owing to the immense amount of charge that had to be passed through the furnaces. Many experiments were also made with water concentration, but unsuccessfully. Afterward Knox & Allen, of New York, were asked to advise on the subject and they decided to try the Wetherill system of magnetic concentration. The plant had been completed and was in working order early this year, when unfortunately the power-house was burnt to the ground. After a delay caused by re-building, the plant was once more started in October and before long we should have some news as to the results. During the summer a new wet concentrating plant to treat 150 tons per day has been erected, so that at the present time the dry and wet processes are working side by side. The directors, among whom there is now Mr. Colquhoun, lately manager for the Arizona Copper Co., are well aware they still have a difficult task before them and are not making any rash promises. Large sums of money have been spent by the company. About £400,000 in shares and cash went as purchase price and over £750,000 in cash has been spent in development and machinery.

In your issue of November 7 I gave some belated details relating to a dispute between the Great Western railway and the Carpalla China Clay Co. relating to the ownership of mineral rights under the land over which the railway runs, and I mentioned that the whole gist of the matter was the definition of the word 'mineral'. The case has since gone to the Court of Appeal, where it was re-argued at equal length. The arguments were amplified and the points of view varied, but eventually the appeal was dismissed and the judgment of the court below upheld. Your readers will remember that the Great Western Railway brought an action against the Carpalla company to prevent them from winning the clay from ground adjoining or underneath the railway. The Carpalla company owned the mineral rights under the railway and claimed that they were therefore entitled to mine the deposit. The railway company argued that china clay was not a mineral, an argument that introduced endless confusion among the scientific witnesses. The judge eventually held that china clay was a 'mineral' within the meaning of the act and gave judgment for the Carpalla company. In the Court of Appeal the same ground was gone over again, and the railway company laid great stress on a judgment given under the same act in another clay lawsuit. In this other case the clay was quite a different substance, being a recent deposit and forming part of the soil. Certain parties wanted it for use in making bricks and claimed it accordingly as a mineral, but were unable to substantiate their claim in the courts, which held that the clay was part of the soil and not a mineral within the meaning of the act. The judges trying the appeal in the Carpalla case pointed out that these two cases were entirely different and had no bearing on each other. Consequently, they upheld the contention that china clay is a 'mineral' within the meaning of the act. In all probability the case will now go to the House of Lords to be argued once more.

The Atbasar copper properties have recently been introduced in London by the group that has the Spassky mine in hand. These mines are in the Akmolinsk province of Siberia, and the Spassky is well known as an unusually rich deposit. The properties of the Atbasar company are situated a few hundred miles farther to the west and are equally noteworthy. They are situated 230 miles northeast of Perowsk, which is an important centre on the Orenburg-Tashkend railway. The formation is unusual. The country is flat, but contains a plateau 70 ft. above the level of the rest of the district. This plateau occupies about 20 square miles and consists of a sandstone deposit. At various points there are malachite outcrops and at depths of 50 to 70 ft. from the surface are found flat beds of bornite averaging 3 ft. thick and containing 15 to 20% copper. Prospecting by shafts, drifts, and diamond-drills proves the continuity of the deposit over considerable areas. Pellew, Harvey & Fell, the consulting engineers, are careful appraisers. They state that over one small portion where the prospecting has been specially concentrated the existence of over 200,000 tons averaging 14% is a practical certainty, while over other parts where preliminary investigations have been made the possible ore may be put down at seventy million tons. The ore deposit is therefore interesting and important.

TORONTO, CANADA.

Break in Cobalt Stocks.—Restraint of Wild-Catting.—Consolidations of Cobalt Mines.—Electric Iron Smelting.

The market for Cobalt mining stock broke badly this week with a general drop in prices all along the line. There had been heavy buying in anticipation of an American demand after the election, which failed to materalize to the extent anticipated, and some speculators in futures

O'Brien Shaft-House.

were unable to fill their contracts or were obliged to realize at a loss. Another cause of the reaction in listed stocks is the bewildering number of new flotations, and the diversion into these channels of capital that would otherwise have been put into the older established issues. Undeterred by the experience of the former Cobalt boom, and the dropping from the list of numerous speculative enterprises formerly quoted at high figures, which have failed to make good, a large amount of money has during the last few weeks been risked on temptingly advertised prospects, offering shares at bargain-counter rates. Some of these may turn out all right eventually, but in the meantime the effect has been injurious to the market for dividend-payers, and is calculated to bring Cobalt securities generally into disrepute.

The Toronto branch of the Canadian Mining Association has for some time been urging the Provincial Government to take such steps for the suppression of 'wild-catting' as are authorized by the provincial laws. There is no legislation whereby speculators can be prevented from taking chances in prospects, even of the most dubious character, but in one direction the law is strict, namely, in demanding that all prospectuses and advertisements shall give full and explicit information concerning the details of a flotation, on which a prudent investor would wish to be informed. But so far this has never been enforced, nor its violation punished. Last week, however, Provincial Secretary Hanna published an announcement to the effect that

the Government intended to take action. After stating that "flagrant disregard of the prospectus clauses of the Ontario Companies Act appears to be as great as ever," and that "flotations of the Highland Mary class and the methods there adopted seem to prevail unabated," the document announces that steps are being taken to bring before the courts a number of cases to which the attention of the department has been called, unless those interested proceed at once to comply with the law. The Provincial Secretary sets forth, for the benefit of promoters and investors, the requirements of the act as regards prospectuses, which among other things are supposed to give the names of the directors, their interest in the promotion, and the remuneration they receive; the amount of shares given for property or services; amounts paid in commissions or to promoters; minimum subscription on which directors may proceed to allotment, dates and parties to material contracts and places where same may be inspected. It is hardly necessary to point out that the publication of details of this kind would be fatal to the industry of the wild-cat promoter. "Sech questions as dem would destroy any system of theology," as the colored pastor remarked when cornered by the higher critic. So these requirements have been systematically ignored, and whether any material result will follow Secretary Hanna's warning may be doubted, in view of the laxity shown in dealing with the Law and Russell case. Possibly an explanation of the long immunity of these notorious promoters may be found in the fact that their counsel, T. H. Lennox, whose legal ingenuity, no doubt well rewarded, enabled them to pocket the proceeds of one flotation after another with a show of legality, sits in the Legislature as a strong supporter of the Government. He was triumphantly returned at the last election, the question of his participation in the Law and Russel rascalities never being even raised during the campaign. Supposing any fearless and honest government official were to endeavor to enforce the law, instead of merely warning and threatening, he would not go very far before he encountered some man with a pull and get a hint from his superiors not to injure the party by undue zeal.

There is a tendency in the direction of mergers of mining properties in Cobalt. The La Rose amalgamation has been followed by the consolidation of the Cleveland Cobalt and Clear Lake mining companies with the Cobalt Light, Heat & Power Co., the bulk of the stock of which latter concern is held by the Cleveland Cobalt. The large holdings of the Clear Lake company in Lower Lorraine are included. The profits of the power company will help to furnish working capital for development on a large scale. Negotiations are pending for the amalgamation of the Right of Way and the Cobalt Station Grounds Co., recently organized. An English syndicate is largely interested in the deal. At the Chambers-Ferland upward of 1000 ft. of underground development has been done during the last four or five months at the 100-ft. level. No. 1 shaft will be continued from this level to 175 ft. There has also been 1800 ft. of surface trenching done, resulting in the discovery of 8 new veins. The La Rose vein No. 1. has been cross-cut on the Chambers-Ferland by an adit from the Right of Way, and the latter company has agreed to drive a raise for the Chambers-Ferland at a cost of $15 per foot. At the City of Cobalt a big new compressor plant is in operation, and development is being steadily pushed. Nearly 3000 ft. of underground work has been done. During the winter the main shaft will be sunk from its present depth of 200 ft. to the 300-ft. level. On the Peterson Lake lease of the Little Nipissing the main shaft is down nearly 150 ft., where a station will be cut. Rich ore is being taken from a vein averaging 12 in. This was struck 40 ft. east of the main shaft at a depth of 100 ft., on which 25 ft. of driving has been done, yielding some large native silver nuggets. This vein has been traced 400 ft. on the surface. The Buffalo expects to have a cyanide plant in operation by the first of the year, and thereby to increase the silver recovery to 95 per cent, in place of between 80 and 84, as at present. Driving on vein No. 12, on the 175-ft. level, is disclosing much richer ore than was obtained from the same vein at 80 ft. The Crown Reserve recently paid the Provincial Government $10,257 as royalty on the output for three months. S. Bennett, a trusted employee of the O'Brien mine, who had access to large quantities of rich ore, was convicted on November 17 of stealing 320 lb. of ore, nearly all silver nuggets, and sent to jail for eight months. Other cases are pending.

Dr. Eugene Haanel, Director of Mines for Canada, has gone to Sweden to be present at the starting of a new electric furnace erected by a firm of Swedish iron-masters at Dumnarfvet. This furnace is claimed to be superior in design to any yet devised. As a result of the Sault Ste. Marie experiments in electric smelting, under Dr. Haanel's supervision, further investigations were made by experts engaged by the Swedish firm. The Dumnarfvet furnace will use 800 hp., in place of the 250 used at Sault Ste. Marie, and a furnace on the same plan, it is stated, can be built at a cost of $20,400 to use 3000 hp. and produce 10,000 tons of pig iron per year. The cost of production per ton by the Swedish process is given as $12.03, which is three-fourths of the cost of production by ordinary methods. Dr. Haanel will report on its applicability to Canadian conditions. The Mines Department is anxious to solve the problem of making electric smelting commercially successful, as only by this means can many of the large iron deposits of Ontario and Quebec, remote from coal mines, be rendered valuable. Even with an amply supply of fuel there are many of these deposits unsuitable for ordinary smelting, owing to their large percentage of sulphur, whereas the electric furnace can treat iron with a sulphur content as high as 2½%. While in Europe Dr. Haanel will also investigate recent improvements in producer-gas engines.

DURANGO, MEXICO.

Tamazula District. — Developments at Topia. — Los Animas Mine.— New Work at Mapimi.

Ferdinand Sustersick of Guadalajara has acquired control of Los Reyes mine, in the Tamazula district, in the extreme western part of the State of Durango. He also has a bond and lease on another property in the same locality. The Los Reyes is considerably developed, showing good bodies of silver, lead, and gold ore. Mr. Sustersick is considering the advisability of erecting a smelting plant on the property, and if such improvements be decided on, the equipment will be hauled to the mine from Culiacan or some other place on the new line of the Southern Pacific, which is being built southerly through Sinaloa.

Tepehuanes is at the terminus of the National railroad, which extends north from Durango. It is the outfitting and shipping point for Guanacevi, Topia, and Portilla. Shipments from Guanacevi are now about 600 tons per month of crude ore and concentrate; bullion shipments amount to ₱50,000 per month, those of cyanide precipitate being about ₱18,000 per month. The bullion and precipitate shipments come from the Mexico Consolidated M. & S. Co. and the San Rafael; other ore shippers are the La Aguaje, La Restauradora, and El Verde. Topia ordinarily would ship 200 tons of ore per month, but there is only a small tonnage moving at present.

W. P. Miller of San Francisco has a long-term lease on the San José de Los Llanitos mines, situated in the Topia district, 90 miles west of Tepehuanes. The group comprises five different properties, close together, which are well developed by levels driven in from the surface. The ore contains about 55% silica, 10 lime, 30 with sulphides of iron, zinc, and lead, carrying from 60 to 90 oz. silver and $2 gold per ton. The 10-stamp mill on the property was formerly equipped for pan-amalgamation and lixiviation, but the plant is being so changed as to provide for giving the pulp a chloridizing roast, this to be followed by cyanidation. Tests have been made by which Mr. Miller is assured an extraction of 85%. Heretofore some of the highest-grade ore has been packed to Tepehuanes, the nearest railroad station, but in the future it is proposed to treat all grades

at the mill. Canelas is the nearest town to the Topia district, being 15 miles south. Canelas is half way between Tepehuanes and Culiacan, and it is claimed that eventually the packing, hauling, and travel from Topia and Canelas will go to Culiacan. The other mines in the Topia district which are active are La Portilla, Cardeña, and San Ramón. Near Canelas are some of the old Spanish mines which are now idle.

The Los Animas Mining Co. is operating in the Puebla Nueva district, 85 miles southwest from the city of Durango, in the Sierra Madre mountains. The company is controlled by E. A. Wiltsee of New York and S. D. Bridge of Monterrey. This mine has been worked several years, and is developed by adits opening a series of veins. The mines, which contain silver and gold in quartz, strike through andesite. The mill is now having its capacity increased to 50 tons per day. The equipment consists of stamps, concentrators, tube-mills, and cyaniding facilities. The ore contains some iron sulphide, carrying gold, the silver being mostly in the form of argentite. It assays about $15 to $18 per ton. Water-power is used part of the year, but it is supplemented by steam. F. L. Norris of Durango is the company's consulting engineer, with S. H. Parsons in direct charge of the work.

The Santa Cruz M. Co., controlled by J. S. Venable, J. R. Dougherty, and Bert Roby, is developing a property in Otaez district, 95 miles west of the town of Durango, the work being in charge of Harvey S. Lord.

Palmilla Mine, Near Parral, Mexico.

Some promising mine development is in progress at Mapimí, other than at the Ojuela of the Peñoles company, several of the new properties having reached the producing stage. The Suerte, managed by Geo. Stinson of Mapimí, is a mile south of the Ojuela, on the opposite side of the limestone bufa whereon the Ojuela is situated. Operations at Suerte are not extensive, but sufficient has been done to show irregular bodies of silver-lead ore in the limestone, contiguous to a porphyry dike. A small shipment of this ore netted the Suerte people ₱50 per ton. In one place the orebody is 50 ft. wide. The Alberto, belonging to the Coahuila Mining & Smelting Co., of Viesca, has been producing since last May, the proceeds in six months having reached ₱25,000. Some of the ore shipped assayed 680 oz. silver and 70% lead. The principal part of the gangue is lime. The silver occurs as sulphide and chloride and the lead as galena and carbonate. The Alberto has been opened to a depth of 280 ft. on an incline shaft. W. H. Williams, superintendent of the property, states that an aerial tramway will be built, 2½ kilometres long, to carry the ore from the mine to a loading station at the wagon-road. There is a wagon haul of 10 kilometres to Mapimí. The American M. Co. is developing the Tauro, which adjoins the Ojuela and San Juan grounds. This is in charge of E. F. Sheets, who has completed 1500 ft. of development, and who is prospecting both laterally and vertically with diamond-drills. The Coronado, Begonia, Tomasita, Abundancia, and others are likewise being developed.

The Providencia de San Juan de La Luz mine, situated 50 miles north of the town of Guanajuato, at San Felipe, is adding 30 more stamps to the 10-stamp mill and installing a cyanide plant to treat the medium grade ore in the mine and on the dumps. Shipments of the high-grade ore have been sent to one of the Monterrey smelters. The ore consists of ruby silver and gold in quartz, in about the ratio of 1 kilo of silver to 2 grams gold. The value of the ore is variable. The property is controlled by Mexican capital, Señor Robles being the superintendent.

MEXICO.

Vogelsteins at Oaxaca.—New Mills.—Option on El Tigre, Sonora.—Mines Closing at Parral.—Activity in Other Districts.

For some weeks numerous rumors have been current to the effect that the Consolidated Metals Co., in which the Vogelsteins are largely interested, is negotiating with the Magdalena Smelting Co., or the Oaxaca Smelting & Refining Co., or both, with a view to obtaining control of one of these enterprises and entering actively into the smelting business, and thus keeping for itself the ores it has under contract, instead of turning them over to the Teziutlan and other smelters. It is doubtful if there is any foundation for these rumors. Although the Vogelsteins have for a number of years been seeking a favorable smelting proposition in Mexico, it is not probable that they would consider entering that business at Oaxaca, which is rather out of the way for the building of a large smelting industry. It is certainly to be hoped, however, that either one or the other of the above-mentioned plants may be able to obtain the necessary capital with which to resume operations, for Oaxaca is sorely in need of a custom smelter, the nearest being that of the Teziutlan Copper Co., at Teziutlan, Puebla, which is almost entirely equipped for copper. The general condition of mining throughout the State of Oaxaca seems to be improving, and a number of mills are in course of construction or in contemplation. Among these may be mentioned the Gnebeshe mill, which is nearing completion; that for El Socorro, of 10 stamps and a cyanide annex; the Frida Mining & Milling Co., at Zimitlan, which has resumed operation and given orders for a mill; and the new mill of the San José de Gracia, in Sierra Juarez, which is now operating and receiving ore from four fine looking stopes in the mine. Work has also been resumed on the Dolores mine of Adolfo Fuos, in the Ejutla district, and the Escandon mill, in the Peras district, is again in operation. It is stated that the Boston-Oaxaca Mining Co., under the management of W. S. Main, will shortly resume work on the Placer mine, in the Tialcolula district, and will continue the present 100-ft. shaft to a depth of 300 ft., and will then cross-cut to the vein.

It is understood that the option that was held by either Phelps-Dodge interests or the Consolidated Mines Selection Co., for $7,500,000 on El Tigre mine in Sonora, has expired, and unless a renewal has been given, the deal is off. The statement has been made that this property, controlled by Kansas City people, has about $13,000,000 worth of ore blocked out.

With a suddenness sufficient to cause a severe shock has come the practical closing down of a number of properties in the Parral district in the State of Chihuahua, leaving it more quiet than it has been before in many years. The drop in silver last fall put a number of properties in distress, though practically all continued at work, hoping for better prices, but gradually new work was curtailed, the

lower grades had to be cut out, and finally, when silver dropped below 50c. it was the 'last straw'. The entire cutting off last month of shipments from the San Francisco del Oro was indeed a blow. Only the Rayo company is doing much work. There is a small production of high-grade ore, but that, of course, is limited, and the prospects are not bright with the present falling silver market. The districts around the city of Chihuahua, and tributary thereto, however, seem to be in excellent condition, and are apparently limited in their production only by the supply of cars for shipment. For some unknown reason there has been an unusual shortage during the past month. Of course, such properties as the Republica, Rio de Plata, and Dolores, in western Chihuahua, continue the regular shipments of high-grade concentrate and bullion, as does also the Calera Mining Co. its cleanly separated lead and zinc sulphide at the rate of a little over one car each per week. This concentrate is produced on the Sutton-Steele dry-table concentrator. Closer in, particularly at Santa Eulalia, the work has been most encouraging. In this camp the Potosí, the Chihuahua Mining Co., and the Santa Eulalia Exploration Co., continue with the usual heavy combined shipments of about 600 tons per diem. The Mina Vieja, of the A. S. & R. Co., is still busy with the rich body of silver-lead recently found, and is shipping 100 tons per day to the smelters. The Velardeña, also of the A. S. & R. Co., has broken into a new body of rich ore and has begun shipping to El Paso. The Santander mine, of C. O. O'Callahan, has just struck what apears to be the edge of a large body of 200-oz. ore. The Chihuahua plant of the A. S. & R. Co. now has three furnaces in full blast, and is sending out daily a 60,000-lb. car of lead bullion. Altogether Chihuahua is improving in prosperity.

BUTTE, MONTANA.

Estimates of Montana Metal Production.—Increased Ore Tonnage in 1908.—President Roosevelt and the Smelter Smoke Nuisance.

The State Mining Inspector estimates the value of the total metal product of Montana in 1908 at $57,945,000, of which he credits $45,195,000 to copper, $8,000,000 to gold, $2,250,000 to silver, and $2,500,000 to lead, an estimated decrease from the value of 1907 of about $2,000,000. The quantity of the output is materially larger, especially in copper and silver, but the prices have been much lower. Copper, for instance, will show an increase of nearly 29,000,000 pounds. At present the monthly output of copper is close to 30,000,000 lb., and the tonnage of ore is in excess of 15,000 tons daily. The number of men employed in and around the mines of the district is within about 1500 of the high mark, the number at present employed being estimated at 10,800.

Reports from Washington are to the effect that the 'smoke nuisance' in connection with the operations of smelters has led to a recent conference with the President. It was represented to him that the gases are destroying vegetation and forests and contaminating the streams so as to make the water unfit for irrigation or domestic use. President Roosevelt, it is said, decided to hear the side of the copper men before taking action. Several years ago a number of farmers residing in the valley adjacent to the Washoe smelter combined and brought injunction proceedings against the Washoe smelter, in an effort to close it. The case has been pending in the Federal Court of Montana for several years and has been a hard fought suit. Judge W. H. Hunt now has the matter under consideration and a decision is expected shortly. In view of this fact it looks not unlike a shrewd or questionable move on the part of the farmers and enemies of the Amalgamated Co. to make another direct appeal to the strenuous President to take a hand in the fight on the plea that the gases from the smelter were injuring the scrub timber and sage brush on the Government reserves in that part of the State. They did the same thing at the time they collected evidence to present at the trial against the smelter, and they succeeded in interesting the President in their case. Special agents of the three departments were sent to Montana and they spent several months on an investigation, chiefly gathering evidence on the side of the farmers. Before the injunction suit was brought many of the farmers in the valley made a regular business of 'settling with the company' for damages done to their property, but the company finally got tired of it. The farmers then proposed to sell their farms and ranches to the company, and a settlement could have been effected on that basis for about $2,000,000. It is understood that the head of the legal department of the Amalgamated Co. strongly urged a settlement by purchase of the farms, and went to New York to so advise the directors. When he arrived there he found a mass of documents and affidavits from the heads of the operating department, representing that the smelter was doing no damage, and terming the demands of the farmers as something like a hold-up. The Amalgamated Co. did not buy the farms. Then the injunction suit was brought, and President Roosevelt was drawn into the controversy. The prospect now is that it will cost the Amalgamated many times $2,000,000. The smelter itself was erected at a cost of $10,000,000. When the agitation started the company built a large stack, through which it carried off some of the fumes and saved the arsenic. But the sulphur is so great in quantity that it is not practical to save it; converted into sulphuric acid it would many times supply the world's demand.

JOHANNESBURG, TRANSVAAL.

Labor Figures.—Passing of the Tailing Wheel.—Rand Profits Per Ton.—Mines Trials Committee.—Re-sueing Narrow Reefs.

For several months past, journalistic reports and the speeches of directors relating to the progress of Rand mining have been marked by a silence, as awakening as that coincident with the stoppage of a mill, upon all questions of unskilled labor. It is difficult to believe, however, that the old cry of shortage will not find expression once more in the near future. Even if there were still a superabundance of natives available for the active mines, one would be obliged to anticipate the abnormal demands to be set up by the many new properties, with doubts as to the means of their satisfaction. But already several companies are complaining of an inadequate supply; the difficulties attendant upon the employment of a considerable proportion of 'green hands' are normal. To some degree a moderate shortage is beneficial, and forces an economy of labor not always apparent in the rare times of surplusage, when companies almost instinctively absorb all 'boys' offered to them. The first indication of genuine scarcity appears when Kaffirs applying for work are taken regardless of previous records.

The number of natives now employed by the mining industries of the Transvaal stands at a phenomenally high figure, and it is interesting to note the large proportion it constitutes of the total labor-force of the Colony. In all labor districts, the total number of native workers (including domestic servants) is roughly 243,000; of these 170,000, or 70%, are employed by 'mines and works', and about 140,000 on gold mines alone. In addition to these Kaffirs, there are still 14,000 Chinamen, whose places must be filled before the end of 1909. The requirements of the industry may be placed at about 15 boys per stamp.

A great deal has been written of late, in the MINING AND SCIENTIFIC PRESS as elsewhere, concerning the 'passing of the tailing-wheel'. We have also heard at times of the passing of the Cornish pump, and even the gravity stamp. Certainly, the day of the Cornish pump has departed with the gradual increase of depth, and although it has proved so invaluable a factor in the past, the time has surely come for its abandonment in favor of electrically driven plunger-pumps or possibly of centrifugals, for mine drainage. But the gravity stamp and the tailing wheel fall under a different category, and are uninfluenced by the change of mining conditions. Their only enemy is technical progress. The gravity stamp, so far from retiring in the face of the onslaught made upon it, and in spite of the auxiliaries sent to its assistance in the shape of tube-mills, has in many

respects increased in importance and security of tenure. What is to be the fate of the tailing-wheel? That pumps are now highly popular and are being widely installed to perform the work of tailing elevation from below the amalgamating plates to the spitzkasten serving tube-mills and cyanide works is unquestionable; so general, indeed, is this shifting of favor, that it requires little courage to predict the complete victory for the pump in all new fields of construction. It is possible, however, that this indicates but a transition stage. In the opinion of one leading metallurgist—whose full views cannot yet be published—there is the possibility of great economy in pulp-elevation by effecting it in two stages. Under recent conditions, the entire mill-pulp has been raised (perhaps 40 to 50 ft.) to the point necessary for the service of the sand and slime-plant. A portion of this pulp, however, is eliminated by the classifiers for feeding the tube-mills and these machines are so placed —generally below the level of the main amalgamating plates —that a high lift is not required for their service. Consequently a great part of the pulp is needlessly elevated to the full height. By two-stage elevation, the total pulp will first be raised to a point enabling the tube-mill feed to be drawn off, and then the remainder, for the sand and slime plant, to be elevated to the upper classifiers. Under these conditions the tailing-wheel, the principal defect of which lies in its capital expense, may again be found advantageous; only in high lifts has the pump proved itself the

Map of South Africa.

better unit, for the cost of the tailing-wheel increases proportionately to the square of the radius. The truth of the oft-cited statement that the Rand is a comparatively low-grade goldfield is constantly becoming more apparent in the light of recent returns. In accordance with universal experience, it is noticeably growing more dependent upon profits drawn from poorer reserves. Only by an appreciation of this fact can the true significance of increasing aggregate yields and profits be gained. An analysis of the Rand's September profits (total, £1,025,000) provides striking evidence of the importance of ore yielding a return which in many fields would be quite unpayable. With average working costs of 17s. 5d. per ton, companies may be segregated as follows:

	Profit per Ton.				Number of Companies.
	s.	d.	s.	d.	
Over	30	0			2
From	25	0	to 30	0	2
From	20	0	to 25	0	1
From	17	6	to 20	0	3
From	15	0	to 17	6	7
From	12	6	to 15	0	7
From	10	0	to 12	6	12
From	7	6	to 10	0	11
From	5	0	to 7	6	11
Below	5	0			7

The yield of these 63 companies (representing the whole Rand) averaged $7.22 per ton, of which 62% is contributed by the amalgamating plates.

The Mines Trials Committee, recently formed for the purpose of encouraging inventors by investigating and putting to practical test promising ideas submitted to them, has already performed much work and has diligently waded through a mass of proposals purporting to raise the efficiency of metallurgical practice. Of course, there has been considerable heart-burning in many quarters over refusals of the Committee to spend money upon certain schemes, for the inventor is almost invariably past the influence of outside discouragement, and, with him, lack of favor is merely a sure sign of ignorance or prejudice. However, the patentee on the Rand has plenty of opportunities for the advancement of his ideas apart from the Mines Committee, which is only applied to by many as a last resource. The originator of new ideas in the States, on the other hand, perhaps in need of information as to the practicability of a scheme's application to Rand conditions, should find the Committee of great service. The body represents every important mining group on the field—and represents them well. It may be repeated (circulars have already been widely distributed) that inventors are urged to provisionally protect their ideas before submitting them, to suggest what remuneration is required if adopted, and to give all possible information, together with drawings and specifications. It must be borne in mind that the Committee only deals with devices or processes connected with ore treatment from shaft-head to dump, so that rock-drills, for example, do not fall within its field of activity. Several have expressed satisfaction with this limitation of scope, and perhaps the Committee will subsequently enlarge its field. In view of the approaching rock-drill competition, perhaps this particular appliance may still be specifically 'barred' with advantage.

Little has been heard recently of the 're-sueing' system of mining, because, presumably, it has been found so rarely applicable with success. Nevertheless the 'jumpers' continue to 're-sue' some of their few remaining blocks of reef, and at the Windsor the system has been introduced with admitted benefit. Opinions are likely to differ radically upon the matter, and it must be confessed that it is frequently condemned or applauded upon somewhat flimsy testimony. Re-sueing, briefly, is that system for mining narrow inclined reefs, of 3 or 4 in. width, by which the underlying waste is first broken out and packed in the stope, and the reef then blasted down (with as little waste as possible) and sent up for treatment. The object in view is to raise the grade of ore milled and avoid the cost of tramming, hoisting, and treating waste rock. Mining costs per ton milled naturally increase, but it is claimed by some that the increased grade more than balances the higher expenditure. In deciding the possible applicability of the system, it is necessary to consider whether the whole mill can be kept going on the re-sued ore, and also whether the greater percentage of surface sorting is practicable when working in the ordinary way. Under any circumstances, whether mined separately or in the single face, the waste can to some extent be stored underground. Probably the chief defect of the re-sueing system is the loss of fine ore, which is commonly rather high in gold. The scheme was given an extended trial in the old Nigel mine, on the southern lip of the Rand basin, 30 miles southeast of Johannesburg. Re-sueing was found costly from the standpoint of handling and explosives, and was abandoned completely in favor of ordinary single-face mining. The reef averages only 4 to 6 in. in width, and dips at 15 to 18°, lying on a slate foot-wall. This slate now makes a good floor to the stope. Pack-walls are still put in, but at a distance of about 40 to 50 ft. from the face, and are well made so as to catch a minimum of fine ore. The stopes are well brushed down. The previously noted objection to re-sueing is particularly well exemplified at the Nigel today, for it is being found profitable to pull down the old packs of slate and remake them, in order to recover the rich fine and the many lumps of ore inadvertently included.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

The St. John Del Rey gold mine, in Brazil, is 4250 ft. deep vertically. The vein has a dip of 45 degrees.

'Dig' and 'pug' are the names given in the Australian States to that which the American miner calls 'gouge', and a Cornishman 'hulk' or 'fluccan', and which in the text-books is termed 'selvage'.

The gold-bearing veins of Hog mountain, Tallapoosa county, Alabama, are in a granite core intrusive within slate. When the veins approach the slate they become poor, and at the contact they cease to exist.

Adjustment of a jig should be so made that the stroke will end approximately at the same moment as that at which the particles in the ore fed attain their uniform velocity of fall. The reverse stroke should then be prompt, so as to quickly consolidate the bed.

The greatest altitude ever reached by man in a balloon ascension is 35,500 ft. Balloons for exploration of the upper air, fitted with automatic recording apparatus, have attained an elevation of 85,000 ft. (16.1 miles). The highest level ever reached by a kite is 21,100 feet.

The electric motor was first applied to traction operations on a commercial scale by Leo Daft in Baltimore, in 1885. Prior to that time successful demonstrations had been made at Saratoga and Coney Island by the Daft Electric Co., and as early as 1880 Edison had designed and operated an experimental electric locomotive with encouraging results.

Hanging valleys are characteristic of the scenery of southeastern Alaska. The wooded slope is threaded by a white cascade issuing from a big cirque or amphitheatre, the floor of which is 100 to 150 ft. above tide-water. In this elevated basin, held within rock walls, there is a lake, marking the former bed of a glacier. This is a 'hanging valley'.

Vanners are used in the best mills, as yielding reliable all-round results in slime-concentration. The problems of slime-concentration have by no means been solved. This is still the weak end of ore-milling, and it offers an attractive field for the mechanical engineer. The modern form of vanner has an oscillating motion imparted to it, the simple side-shake being less effective.

Water is always present in volcanic rocks. No such thing as absolutely dry fusion of rocks occurs in nature. Hence there is an important difference between lavas and slags, and too close an analogy should not be drawn between them. Water lowers the fusion point of rocks, so that pastiness may result at temperatures which are by no means elevated. Water also facilitates crystallization of molten rocks. The solidification of molten magmas is supposed to cause the extrusion of this magmatic water, which is undoubtedly an active agent in the formation of orebodies.

Old tailing offers no peculiar difficulty in cyaniding, except that ferrous compounds will be in excess, especially if much organic matter be present, and the consumption of KCy will be proportionally high. The effect of the organic matter itself is to increase the acidity, which in this case may often be removed by a simple water-wash. If not, recourse may be had to lime for neutralization.

Loess is strictly a name applied to a fine deposit in the lower Rhine valley, and in northern China. It differs from ordinary river-silt in its lower content of argillaceous material. Richthofen suggested that the Chinese loess had been carried to its present position by wind. The term is applied to exceedingly fine deposits of Pleistocene age found in Arkansas, where it is sufficiently aluminous to serve as an excellent brick-clay.

Electric furnaces of simple inexpensive design for retorting or melting are not available in the market, nor are they in general use. Perhaps the most successful electric melting furnace was one designed by J. Bronn of Cologne and used for making glass. Becker and Völcker have also produced successful furnaces of that type, controlled by a Brussels company, l'Industrie Verriere el ses Derives. Gustav de Laval, and Casoretti and Bertani have produced retort furnaces for zinc distillation, the patents of the latter belonging to the Società Elettro-metallurgica, of Lombarda, Italy.

Screening ores after dry-crushing cannot be successfully done in trommels, unless they be of very large diameter, and the speed be adjusted with accuracy to the burden; any variation in the quantity of ore fed will immediately result in poor screening. Regulation of the feed to any screen, whether wet or dry, is most important. Bumping screens are efficient for dry-screening, but are difficult to keep in repair. Tossing screens give excellent results, and are easy to make. The best device for dry-screening, however, is the gyratory screen, mounted on cone-bearings, devised and generously given to the world many years ago by the late Eckley B. Coxe.

Open-hearth steel rails are now being used by some of the more progressive railroads, instead of bessemer steel. P. H. Dudley, of the New York Central R. R. Co., says that the phosphorus content of the new rails will be lower and probably the brittleness will be reduced, but the wearing quality has yet to be determined. The metal must be higher in carbon than is necessary in the bessemer process, with the use of 0.06% phosphorus. Unexpected results, however, follow seemingly trifling variations in composition, as, for example, rails rolled from basic open-hearth steel, in which the carbon was from 0.65 to 0.75%, were tough, but with carbon from 0.68 to 0.78%, much brittleness developed.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Waters, Meteoric and Magmatic.

The Editor:

Sir—Under the above title there appeared in your journal[1] a lucid article by T. A. Rickard in which is brought out the fact that the water encountered in mines is usually confined to a nearly horizontal layer, below which the rocks are drier, as evidenced in the deep workings of many mines. I venture the following notes as a continuation of this discussion.

Recently there have appeared two large volumes, in each of which there is given a theory of the origin of ore deposits, with much detailed evidence, forming a scientific basis for the theory advanced in each case. One of these books is a 'Treatise on Metamorphism'[2] by C. R. Van Hise, and the other is the 'Geology and Gold Deposits of the Cripple Creek District'[3] by Lindgren and Ransome.

The monograph by Van Hise gives his latest views and strongest evidence on his well known theory, which attributes most metallic ore deposits to the action of underground waters originally of a meteoric character. The paper by Lindgren and Ransome gives the best scientific basis, so it seems to me, that has yet appeared for the theory of the origin of ore deposits by magmatic waters, although the fact of the gradation between pegmatite dikes and quartz veins or quartz dikes, as seen, for example, at Silver Peak, Nevada, is a very fetching argument, so strongly insisted on by J. E. Spurr.

The name of Van Hise is so intimately associated with the theory of ore deposits by meteoric waters that one is surprised to note in his monograph that he recognizes:

1. That crystallizing magmas give off water.
2. That this water is probably richer in metallic contents than any deep thermal meteoric water.
3. That such waters have produced ore deposits.
4. That there are complete gradations between purely igneous pegmatitic dikes and purely aqueous vein-material.

However, certain geological facts presented by Van Hise do not appear to have had adequate consideration. I refer to his 'zone of cementation' and its bearing on the underground circulation. It should be recalled that Van Hise recognizes two zones in the earth's crust, a lower zone called the 'zone of flowage', and an upper zone, called the 'zone of fracture'; and that he regards the circulation of meteoric waters as confined to this upper zone of fracture. This upper zone, moreover, he divides into two zones or belts, a lower 'zone of cementation' in which sulphide ore deposits are formed, and an upper or surface zone of weathering in which the surface water acts as an oxidizing agent. His belt of cementation is so designated because in this zone when deeply buried, underground waters have deposited secondary silica, etc., forming dense compact rocks from rocks originally porous.

Van Hise says,[4] "The strongest evidence of the vigorous and extensive character of the circulation in the belt of cementation is the fact that cementation is universal in it. Wherever porous rocks have remained long in the belt of cementation, an enormous amount of material has been deposited by underground aqueous solutions. . . . The great sandstone formations have been transformed to quartzite by deposition of interstitial silica. In the San Juan district of Colorado, great tuff formations of Tertiary age have been completely cemented. . . . Wherever rocks are exposed which once possessed numerous and large openings . . . their general cementation gives conclusive evidence of a vigorous past circulation. In consequence of the process itself, the openings become smaller and smaller; consequently the circulation less and less vigorous, until when the process of cementation is complete, or nearly so, the circulation becomes very feeble. . . In many mining districts, these conditions now exist. At the time of rapid deposition of the ores, there was a pervasive and vigorous circulation, which, as cementation continues, gradually became less and less, and finally practically ceased." Van Hise would thus admit that a belt of vigorous circulation, such as he pictures elsewhere in his monograph as being nearly universal, is in fact quite limited as to depth where the rocks do not now contain capillary pores, and cites the Lake Superior copper mines as an instance. Now, if the underground water circulation is as universal as described, one would expect it to exist fully fledged in a region of precipitation like that of the Great Lakes. Moreover, Van Hise admits that in certain arid regions, like Arizona, the underground circulation may be feeble even when the rocks are porous, but he calls attention to the fact that the arid region of the western United States was quite humid in Tertiary and early Quaternary time, and the numerous fossil lakes of those periods, together with the character of the plant remains entombed in the lake sediments, conclusively prove this to have been the case.

Admitting that cementation was the work of meteoric waters, it is difficult to understand how the vast amount of interstitial filling that was effected by these waters could have been brought about by any but a vigorous circulation, and if we admit this we must also admit that these waters have cemented fractures, or in other words, formed vein deposits. It would thus appear that while a vigorous circulation of meteoric waters has existed in past times to a considerable depth in porous rocks, and that while this circulation may have been the cause of ore deposits, yet no such universal circulation does now exist in the crust of the earth as is pictured by Van Hise, nor did it ever exist in closely grained rocks,

[1] MINING AND SCIENTIFIC PRESS, Vol. XCVI, pp. 872-875, 1908.

[2] Monograph XLVII, U. S. G. S., Washington, 1904.

[3] Professional paper, U. S. G. S., No. 54, Washington, 1906.

[4] Monograph XLVII, U. S. G. S., pp. 1025-1026.

and this would apparently include many igneous rocks, which enclose precious metal deposits.

However, nature is credited with being able to produce similar results in diverse ways. The waves on the seashore erode caves in the rocks against which they dash, and the winds of the desert do precisely the same thing in the rocky reefs against which they blow.

It would seem as if the argument of Van Hise, that cementation is a proof of a former vigorous circulation, has not been adequately met. Certainly the fact that the lower levels of mines are now comparatively dry does not disprove that a vigorous circulation may not have existed at the time the ore deposits were formed.

If, with Spurr, we consider quartz veins as dikes, being the silicious extreme of the differentiation of a magma, we must admit that there is a great difference between ordinary igneous dikes and aqueous dikes, in that the former produce but little chemical change in the rocks which they intrude, while the latter react strongly on the rock walls, taking into solution part of their contents, and depositing it elsewhere as vein material. Thus in the quicksilver deposits in the Lower Cretaceous limestones at Terlingua, Texas, the vein material of the lodes (excepting the secondary gypsum and the crushed and brecciated country rock) is calcite, which was plainly deposited by the same waters that deposited the cinnabar. The reasonable conclusion is that the calcite was derived from the limestone at a lower level (the limestone is 1500 ft. thick), and not from a calcareous magma in the barysphere. If these aqueous dikes take earthy material into solution from the rocks of the crust which they penetrate, why not also to some extent the metals?

The article on 'Rock Pressure and Metamorphism'[5] by H. M. Chance would tend to show that cementation takes place by welding, and the pressure to effect this is ascribed to thrusts. Mr. Chance thinks that cementation by welding will explain the formation of quartzites quite as well as the circulation of ground waters. In the case of welding, no addition of material would take place, but there would be a diminution of volume; while the formation of a quartzite by circulation of water carrying silica in solution would mean an addition of material but no great change in volume. If such thrust-stresses as those described by Chance produce cementation, it is evident that cementation would vary in the same beds, for the strain would not be uniformly distributed, but cumulative.

Mr. Chance himself notes this point, and states that it explains "the variations observed in sedimentaries, especially sandstone and grits, which in some places may be completely cemented, in fact almost completely converted into quartzites, while at other places near by they may retain the loose-grained porous structure of slightly cemented sand beds." While this is doubtless true, it is believed that this phenomenon is local and occasional, and bears little relation to the cementation of porous beds of enormous extent, and which show no such evidence of welding as is required by the stress or welding theory.

The best evidence on this question is to be obtained by an examination of thin sections of the rocks, and it should be stated here that Van Hise has studied many thousands of such sections in arriving at his conclusions. In effect, the thin sections of most quartzites do not show evidence of crushing or welding to a marked extent (at least this is true of massive beds covering large areas), but on the contrary, the original sand grains are often clearly recognizable, and the fact that the pores have been filled with interstitial silica is evident. In a thin section where pressure has been exerted on the rocks, we find in miniature what may be seen on a larger scale in the field, namely, fractures and faults, brecciation and granulation. We also find that the grains of quartz and feldspar which are under strain show undulatory distinction (that is, under crossed nicols), indicating that the originally homogeneous arrangement of the molecules has been disturbed by the strain.

H. W. Turner.

San Francisco, November 7.

[5] Mining and Scientific Press, Vol. XCVII, pp. 299-302.

Cyanidation of Silver Ores.

The Editor:

Sir—As a distant but appreciative spectator of the strenuous efforts now being made to develop the cyanide treatment of Mexican silver ores, I have read with much interest F. J. Hobson's article upon certain phases of the subject, in the Mining and Scientific Press of August 1 and 8, and look forward to further elucidation of the points raised. The statements that argentite is readily soluble in cyanide solution, while practically no extraction can be obtained from native silver, are of great interest and importance, in view of the author's long practical experience. It is not, however, clear how the interference with mill solutions of ferrous iron, existing as ferrous sulphate in the ore, is removed by preliminary treatment with lime, as the ferrous hydrate formed consumes oxygen, or reacts with potassium cyanide to form soluble potassium ferrocyanide. Also it is difficult to see why the percentage of moisture in a slime-residue is affected by the cyanide content being 0.01% KCy, or any other percentage.

Mr. Hobson's equation to express the dissolving of argentite seems but a partial expression of the truth, and would be clearer if expressed in two stages, thus:

$$Ag_2S + 4KCy = 2KAgCy_2 + K_2S$$
$$K_2S + KCy + O + OH_2 = 2KOH + KCyS$$

In the above form the origin of soluble silver sulphide existing in limited quantity at any one time in the solution is explained, apart from the formation of this substance by the action of an alkali hydrate on base-metal sulphides present. Further, the above two-stage reaction is not incompatible with the formation in solution of soluble sulphur compounds other than sulphides or thiocyanates, as already detailed in your columns of May 2, 1908 (p. 594). Mr.

Hobson's suggested reaction for the removal of soluble sulphides by means of potassium-zinc cyanide forms the basis of A. F. Crosse's process for regenerating free potassium cyanide from the double zinc-potassium cyanide in working solutions by means of alkaline sulphides. (Proc. Chem. Met. & Min. Soc. of S. A., p. 272, March, 1903, Vol. III.) This reaction is incomplete in cold dilute solutions, and it appears probable that soluble sulphides are likewise removed by oxidation during aeration of the charge, while the occurrence of sulphur in the zinc-boxes may also be attributed to reduction of potassium thiocyanate by nascent hydrogen, resulting in the formation of zinc sulphide, thus:

$$KCyS + 2H + ZnO_2H_2 = ZnS + KCy + 2OH_2$$

As Bertram Hunt has already dealt with the hypothetical existence of mercurous sulphide and cyanide, and the incompatibility in solution of mercury compounds and soluble sulphides, I will confine myself to pointing out certain deductions from Mr. Hobson's experiments which do not appear to confirm the conclusions at which he has arrived. For this purpose I have tabulated the results of the parallel tests as follows, though some details of their execution are lacking, as well as any mention of the original and final assay-values of the material experimented upon:

Reagents.	Extraction, %. Silver.	Gold.
(1) 0.5% $KHgCy_2$ + 0.5% $Ca(OH)_2$	..	30
(2) 0.5% $KHgCy_2$ + 0.5% $Ca(OH)_2$ + 0.2% K_4FeCy_6	86	..
(3) 0.3% $KHgCy_2$ + 0.2% K_4FeCy_6 + 0.2% KCy + 0.5% $Ca(OH)_2$*	85	80
(4) 0.5% KCy	51	90
(5) 0.2% KCy	32	90
(6) K_4FeCy_6 + Hg_2Cl_2 or $HgCl_2$	..	..
(7) 0.3% $KHgCy_2$ + 0.2% K_4FeCy_6 + 0.2% KCy	43	90

*The presence of lime in test (3) is inferred from the account of test (7).

The relatively different extractions of silver and gold, under the varying conditions shown above, confirm the statement that the same factors affect differently the extraction from the two metals (see MINING AND SCIENTIFIC PRESS, p. 295, August 29, 1908).

As regards the silver, the use of free cyanide, together with potassium mercurous cyanide and potassium ferrocyanide, in (7) affords an extraction of 43%, intermediate between the plain cyanide results of 51% in (4) and 32% in (5), but the addition of lime to the reagents employed in (7) brings up the extraction to 85% in (3), so that the common practice of using lime is justified, while the advantages of potassium mercurous cyanide and its protective ferrocyanide in themselves are by no means clear. As regards the gold, plain 0.2% KCy solution in (5) yields as high an extraction (90%) as does this same cyanide content, plus potassium mercurous cyanide and potassium ferrocyanide in (7), while all these reagents, together with lime, merely serve to reduce the efficiency to an extraction of 80% in (3), which might be a serious matter with silver-gold ores containing much of their value in the latter metal.

Mr. Hobson points out that aluminum interferences are neutralized by the addition of lime, presumably by precipitation of aluminic hydrate, but how this last insoluble precipitate passes out of the charge with the solution through the filter-cloth, and finally comes to rest in the zinc-boxes, is not clearly set forth. The rôle of reducer attributed to potassium ferrocyanide by Mr. Hobson seems hardly required in a solution which is assumed to be charged with soluble sulphides, and in any case the addition of a reducer seems undesirable when the dissolving of gold and silver is so greatly accelerated by the presence of available oxygen in any form.

In conclusion, Mr. Hobson inferentially supports by his equations the utility of oxygen as well as of lime in the dissolving of silver sulphide, but while mercury compounds in solution may assist by precipitating soluble sulphides, as when $HgCl_2$ was found to raise the silver extraction from 30% to 92%, the author's ingenious theory, claiming still greater merit for the alleged potassium mercurous cyanide, would receive a more unqualified acceptance if supported by the publication of the results of a detailed examination of the properties of this substance, and its effect upon the cyanide treatment of silver ore.

W. A. CALDECOTT.

Johannesburg, Transvaal, October 24.

Inefficient Metallurgical Treatment.

The Editor:

Sir—According to Mr. Hallet R. Robbins, A. B., B. Sc., London, in a recent article published in the *Transactions* of the A. I. M. E. (Birmingham meeting, October, 1908), inefficient metallurgical treatment is one of the main sources of loss with the Oriental Con. Mining Company.

Mr. Robbins made his observations during the latter part of 1905, while in the employ of this company as an apprentice in the Taracol cyanide plant, and not during 1908, as this article would lead one to believe. From his lack of experience, and considering his short stay with this company, I venture to say that Mr. Robbins was not in a position to say whether or not the methods were inefficient.

This company is quite aware that its methods of treatment can be improved upon. Three years ago an experimental plant was erected with the idea of solving the metallurgical problem, and it is not too much to say that no other company has gone about the thing in a more thorough way than the Oriental Consolidated. In all probability, during the coming year numerous changes will be made in some of the plants—improvements in concentration and cyanidation; arrangements will also be made for re-concentrating, re-grinding, and further cyanide treatment of the old tailing dumps.

A. E. DRUCKER.

Taracol, Korea, November 2.

Ore cars of 150 tons capacity are being built for the Carnegie Steel Co., for use at its Pittsburg plant, and not for service between Pittsburg and Lake Erie, as reported by the daily press.

ASSESSMENT WORK ON MINING CLAIMS.

Written for the MINING AND SCIENTIFIC PRESS
By WM. E. COLBY.

The performance of assessment work or annual labor on unpatented mining locations is a matter that assumes importance at this time of year. It is the purpose of this article to indicate briefly the nature of the annual labor required by our mining laws, and to discuss some of the questions that may arise in connection with such work.

Ancient Law.—From time immemorial the performance of assessment or representation work on a mining claim has been a condition controlling the retention of title. The Roman mining law, as shown by a recently discovered inscription, insisted upon continuous work. A cessation for ten days, or, in special cases, for six months, resulted in forfeiture of the mine. The old Germanic mining law was even more rigorous; continuous work, day and night, was a condition of the holding. This was later relaxed, until finally cessation from labor for a year and a day was allowed without confiscation of the mine. The amount of work required by stannary law in the tin mines of Cornwall and Devon varied. At one time a man retained his title for the first year by marking the ground; the second year by the improvements he placed on it; and the third year by the output of tin. Still earlier, the annual work required was the equivalent of one man's labor for three months.

Federal Statutes.—We see in the mining code now in force in the United States, points of strong resemblance to these ancient mining laws. Section 2324 of the Revised Statutes enacted in 1872 provided that "on each claim located . . . and until a patent has been issued therefor, not less than one hundred dollars worth of labor shall be performed or improvements made during each year . . . and upon a failure to comply with these conditions the claim or mine upon which such failure occurred shall be open to re-location in the same manner as if no location of the same had ever been made, provided that the original locators, their heirs, assigns, or legal representatives have not resumed work upon the claim after failure and before such location;" and Section 2 of the Act of 1880 (21 Stat. L. 61) amended the former section by providing, "That the period within which the work required to be done annually on all unpatented mineral claims shall commence on the first day of January succeeding the date of location of such claim . . ."

Time of Performance.—It is evident that a locator has until December 31 of the year following the year in which he makes his location, to perform his annual labor. Whether he can perform the work during the year that he initiates his location and have it count for the year following is extremely doubtful. To be safe, the work should be done after January 1 of the year following the making of the location. While the statute is explicit on the point that the work must be done "during each year", yet the courts are loath to declare a forfeiture, and if a claimant commences his work before the end of the year, and prosecutes it vigorously, on working days during working hours, until it is completed, even though the greater part of it is done in the new year, his claim is not open to re-location. Under such circumstances, where January 1 falls on Sunday, and the claimant is in possession without working, but continues work Monday, an attempted re-location by a third party on Sunday is ineffectual. The same is true of an attempted re-location made before the usual hours of starting work. The postponement of work so as to run over into the new year is an unwise course to pursue, however, and the work should be completed by December 31.

Character of Labor Required.—In order to satisfy the statutory provision, the labor performed or improvements made must be of such character as actually to benefit and promote the development of the claim and facilitate the extraction of mineral therefrom. Sinking shafts, driving tunnels, making exploration cuts and excavations in furtherance of prospecting or mining operations constitute an unquestionable compliance with the statute. Roads and trails constructed for the benefit of a claim, and which are necessary in order to afford access to the mine in question, and buildings erected upon a claim for any purpose reasonably connected with mining operations and its development, may be counted as assessment work. The services of a watchman, where necessary for the protection and preservation of mining machinery and buildings, have been held to be sufficient, but not where there is no intention on the part of the owners to resume active operations within a reasonable time. These last mentioned expenditures, such as for roads, trails, buildings, and services of watchmen, are near the border line, and do not possess the unequivocal character of actual mine openings and excavations. However, the courts are inclined to be liberal in their interpretation of the statutory requirements, and any labor performed or improvements made in good faith that may, with any show of reason, tend to develop the claim, will be considered favorably.

Sampling or surveying a mine, unwatering it for purposes of examination merely, traveling expenses in reaching it, placing of tools, machinery, or buildings thereon, without any intention of using them permanently in actual mining operations, dumping tailing on a claim, have all been held insufficient and not within the spirit of the statute.

The Land Department has held that a quartz-mill situated on a claim and built for the benefit of that claim alone, is not an active agency in the actual development of the mine, since it has no connection with the operation of extracting mineral from the ground, but its function begins only when the process of mining has ceased. While the question involved was the sufficiency of improvements for patent purposes, the analogy would seem to govern in the matter of annual labor as well. This is an extreme refinement of the rule. If subjected to the same rigid test, many improvements that are now admittedly sufficient would be ruled out. The courts are inclined to look to substance rather than shadow, and where good faith on the part of the mine owner

is evident, they construe the law liberally and give him the benefit of any doubt. They are not inclined to be as technical in their rulings on the question of labor and improvements as is the Land Department in patent proceedings.

Group Work.—Oftentimes it would be a waste of labor to perform $100 worth of work on each one of a group of claims held in common. The natural and economic way to develop such a group of claims might probably be by means of a main adit or shaft, or, in the case of placers, by a flume, ditch, or reservoir, constructed for their common benefit. Under such circumstances it is permissible to perform all of the work, to the amount of $100 for each and every claim to be benefited thereby, on one or more claims of the group, or, in special cases, outside of the group. The work must be of such a character as actually to benefit each claim for which it was performed. For example, work on an adit, the portal of which is higher in elevation than some of the claims in the group, would not ordinarily benefit such lower claims. As a rule, the claims must be contiguous, and there must be some community of interest in all of the claims.

By special act passed in 1903, Congress provided that "The annual assessment labor upon [oil-placer mining] claims may be done upon any one of a group of claims lying contiguous and owned by the same person or corporation, not exceeding five claims in all: Provided, That said labor will tend to the development or to determine the oil-bearing character of such contiguous claims."

In the case of association placer-claims only $100 worth of labor is required on each claim, which can not, of course, exceed 160 acres in area.

Annual Labor, How Valued?—The statute is clear on the point that $100 worth of labor or improvements is required each year, commencing with the year following the location. A question sometimes arises as to what constitutes $100 worth of work. There are some district regulations and State statutes specifying the value of a day's work, but it is questionable whether these are valid. The value of a day's labor and of the material used naturally varies with the locality. The courts have held that the test is the reasonable value of the work or improvements, not what was paid for it nor what the contract price was. The actual value is the true test, though what was paid for the work is strongly persuasive as to value, and tends to establish the good faith of the claimant.

Proof of Annual Labor.—Many States have statutes requiring claimants to record affidavits to the effect that the annual labor has been performed, and setting forth the nature and value of the work. No serious consequence can result from a failure to comply with these requirements, though it is always advisable to comply with them. Such recorded proofs are usually made prima facie evidence of the fact that the work was regularly performed whenever such fact is questioned in an action in court.

Resumption of Labor.—The mere failure to perform annual labor does not result in a forfeiture of the claim *per se*. If work is resumed before an adverse location is made, and continued with reasonable diligence until $100 in value has been performed, the law is satisfied.

The provisions of the statute requiring the performance of annual labor are wise and salutary. Without them it would be possible for a few individuals to locate a major part of the mineral lands of the public domain and hold them indefinitely. The necessity of performing annual labor, slight as the burden may seem, proves in actual experience to be a most effective check on wholesale speculation and permanent segregation of mineral lands from the public domain without development. The law is evaded in many instances, but this is not the fault of the law, but rather of its administration. Many claimants endeavor to hold their claims without performing annual labor, and at the beginning of the new year either re-locate the claims in their own names or in the names of others. By so doing they run the risk of losing their claims, and the courts are inclined to look with disfavor on such trifling with the plain intent of the law. If claimants will perform their assessment work with the bona fide intention of complying with the spirit of the law, instead of going to the other extreme and performing as little work as possible, or trying to credit work of a doubtful nature, they will save themselves trouble later on. Many times a claimant is forced to spend hundreds of dollars in litigation to defend his claim against an adverse location when the expenditure of a few dollars in assessment work would have removed all possibility of questioning its performance. As a final word of caution, whenever a claimant is in doubt as to whether the work done is of the proper character or whether it is sufficient in amount, let him abolish the doubt by doing work that can not be assailed. It will bring peace of mind and save money in the long run.

Calcium is a silvery white metal readily oxidized in moist air. It is very light (sp. gr. 1.52), fairly malleable, has a high specific heat, and is a good conductor of electricity. It is about as hard as aluminum, but at 400° C. becomes as soft as lead. It is volatile, and can be sublimed in vacuo between 700 and 800° C., and melts at the latter temperature. It is a very powerful reducing agent. The most promising applications of calcium are as a reducing agent and for the refining of metals. In the latter case it acts in three distinct ways: by reducing oxides and sulphides; by eliminating dissolved gases; and by forming compounds with certain impurities, thus rendering them less deleterious. All three modes of action are strikingly shown in the case of copper. A suitable addition of calcium will remedy 'dry' or 'sulphury' copper, give a sound casting, and give a soft and tough ingot with prohibitive proportions of bismuth or antimony, besides restoring ordinary overpoled copper to tough pitch. If excess of calcium is present, however, it induces brittleness on its own account. With one or two doubtful exceptions, no alloy of calcium has shown any promise of commercial utility, so far as physical properties are concerned, its only likely application in this direction being its hardening property.

MINING METHODS IN THE NORTH.—I.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

The adaptation of methods to conditions is a basic principle in engineering. While the simple devices of the individual gold digger may seem crude when compared to the technical practice of a scientific operator, the fundamental ideas are the same. In extracting the gold that lies encased within veins of quartz, the elaboration of method has progressed so far as to obscure the essential and elementary principles from which modern practice was evolved, but in alluvial mining the departure has been less marked. Gravel mining continues to be a simple process; not the simplicity of a fool, but the simplicity of empirical deduction. It is the growth of experience in overcoming natural obstacles.

In the North, the mining of gold-bearing gravel has passed through stages of development so complete that the description of them will prove suggestive to technical men, even to those whose duties do not involve this kind of mining. I shall endeavor to trace the evolution of methods that have enabled man to extract an astonishing amount of gold. The creeks at Dawson have yielded $125,000,000 in ten years, the alluvial flats of Fairbanks have given the world not less than $32,000,000 in five years, and the golden beaches of Nome have contributed fully $22,000,000 in eight years.

This gold has come for the most part from deposits of gravel lying in or beneath the beds of existing streams, meandering within the limits of shallow valleys. In order to simplify my analysis of the methods by which the gold was won, I shall take a typical example: A small valley overlooked by rounded hillslopes is traversed by a stream the present bed of which is only a few yards wide as compared to the channel, half a mile across, over which it meanders. Bare ground, in the form of gravel, is visible only on the edge and in the bed of the little stream; the remainder of the valley is covered with moss, out of which arise clumps of spruce, some of them more than a foot in diameter. On the hillsides the forest grows scantier, and on the summits the ridges are silhouetted in sweeping lines unbroken by any trees. A few specks of gold are found in the gravel, and there are rare spots where the rim shows coarse 'colors.' The bedrock is probably a soft schist, for that is the formation exposed in the few places where landslips reveal a section. The prospector cannot sink a pit or shaft in the bed of the stream because of the water that drowns his workings. No pumps are available, nor is it feasible to divert the creek by means of a wing-dam, because that would bank the water on another man's claim; moreover, the gravel is so clean and so porous that the water would penetrate into any workings sunk in the bed of the stream. Thereupon the prospector turns to one side and digs into the valley-bottom at a safe distance from the present stream-bed. He finds that under the moss the ground is frozen solid; it is impossible to sink a shaft with a pick, and expensive to do so with explosives. Yet he reasons that the indications point to the existence of gold on the bed of the valley to one side of the present stream, along a course that it formerly followed. What is he to do?

Such was the problem confronting the pioneers in the Yukon and Alaska ten years ago.

Machinery was lacking. The pick and shovel were the only tools available. Wood was handy. What more natural than to overcome ice with fire, to soften the frozen ground by artificial thawing? This was the pioneer's method. He laid his bundle of sticks and made a fire that melted the adjacent ice. In this way he sank a small shaft to bedrock. The work of sinking was done in winter, when surface-water did not impede. After the wood had burned so as to soften the ground, he broke the latter with his pick and hoisted it to the surface in a bucket with a windlass. Then he piled the gravel near the shaft's mouth in a heap, which re-froze during the winter and thawed naturally in the spring. As it thawed, he shoveled it into a sluice-box, and washed it by the help of any water available. His whole equipment consisted of a pan, pick, shovel, a bucket made out of a whiskey-barrel or a hide, fire-wood, a hemp rope, two or three sluice-boxes each 10 or 12 ft. long, and muscle, and more muscle, and persistence. It is wonderful what some of the Alaskans accomplished. Thus Sam Samson and a partner, in the winter of 1901-02, sank a shaft 115 ft. on the Cyrus Noble claim, near Nome. The shaft was only 2 by 4 ft. It was on the 'tundra'. There was no forest to yield good firewood, but Samson found scrub willows near-by and he burned them. He would fill a gunny-sack with willow twigs, dry them in the oven of his stove, and place them in the bottom of the shaft, under cover of a wash-tub, to retain the heat. A fire in the morning and another in the evening sufficed to soften the frozen gravel. He had to conserve the air in his shaft as best he could. He worked in his undershirt, perspiring while the air at the surface was below zero. After sinking 80 ft. without the safeguard of timber, he cribbed the shaft to the surface with inch boards. This was an exceptional case, but it illustrates that grit can overcome gravel, even when frozen. Usually, as at Dawson or Fairbanks, there is a small growth of spruce, quite sufficient to yield the firewood needed for thawing. Usually also the prospector's shaft is not as deep as Samson's. From 30 to 50 ft. is typical.

The gold is found concentrated upon the bedrock. This concentration is more complete in Alaska and the Yukon than in other mining regions; it is due to the clean character of the 'wash', that is, there is so little clay in the gravel that the descent of the heavy gold has not been hindered. It has fallen to the rock-bottom and lies there, sometimes so thick as to be more gold than dirt. In most cases the miner finds his 'pay' confined to the stuff that lies for a couple of feet above bedrock, and within the bedrock itself; for the gold has sunk into the crevices of the rock, penetrating sometimes three feet, if the schist is blocky and shattered. Therefore the operation of mining includes the removal of the bottom

of the sediment on the creek-bed and the top of the rock-bottom. From 2 to 6 ft. of material is considered rich enough to be treated as 'pay' and is washed in the sluice-boxes.

While I speak of the rock-bottom, it must be explained that the bedrock is usually soft. It has undergone disintegration; it has been shattered by alternations of frost and thaw, in a by-gone time; it has been penetrated by water and some of its constituent minerals have been so dissolved as to leave it no longer hard and resisting, but docile as clay. The soft, almost 'mushy', bedrock of the North is a great aid to the miner. He does not need explosives.

When the shaft reaches bedrock, it is an exciting moment. The miner scans the ground to find specks of gold; if the gravel is rich, he can see the gold readily. Then he hoists some of the soft bedrock and the fine sediment that lies on its surface. By the use of a pan he washes this material and ascertains how rich it is. Often he sees a glittering string of yellow particles in his pan; sometimes a piece big enough to be called a 'nugget'; sometimes—nothing, but a little black sand, consisting of the magnetite that is the companion of gold. As an illustration of the extraordinary richness of some of these deposits, I quote the following: In August, 1899, on No. 2 Above Discovery on Bonanza, adjoining the Dick Lowe fraction, George T. Coffey took two shovelfuls, that is, enough to fill a pan, and from it he washed 63⅞ ounces of gold. This included three pieces worth over $100 each. It was possible to see the gold in the gravel when standing 20 feet away. Among those present on that occasion was Angelo Heilprin.

Ordinarily, 10 cents worth of gold, or 2½ grains, per pan, indicating a yield of $13.50 per cubic yard, say, one yard deep, was rich enough to yield a handsome profit to a man who sank a shaft 40 ft. to bedrock.

If the shaft does not 'bottom' in pay, the prospector begins to explore laterally by digging a gallery or drift, following the surface of the bedrock. The shaft may be off the line of the maximum concentration—it has been sunk to the rim of the channel rather than the gutter—and a short drift will enable the miner to find better stuff. Whether he explores for richer pay or opens out into a beautiful layer of golden sediment, he extends a drift from the bottom of his shaft and removes the ground by thawing with fire, as he did when sinking. The removal of gravel by hand-labor in this manner is called 'drifting', as against methods in which water is the prime agent.

Lower Dominion Creek, Yukon.

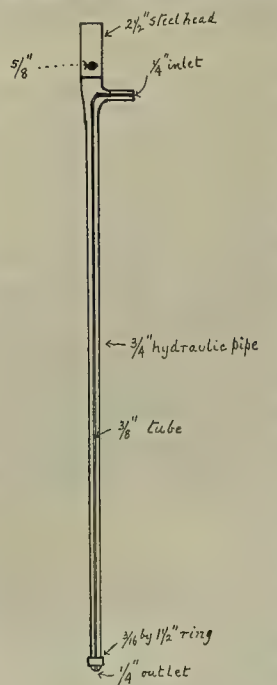
The thaw affects only a small patch of ground; it does not endanger the worker, who burrows patiently under a hard roof of frozen gravel. Bit by bit all the gold-bearing dirt within the boundaries of the claim is excavated and raised to the surface, to be washed in the sluice-boxes whenever water is available. This method of working frozen ground by thawing with wood fires was originated in the Forty-Mile and Circle districts before the discovery of the Klondike. Even where timber is cheap, it is more economical to exploit frozen ground in this way than to operate in thawed gravel. At Nome, it is estimated that the economic limit of working thawed ground (on the Third Beach, for example) is reached when the yield is 4 cents per pan, or $5.40 per cubic yard, for a depth of 3 ft., that being the usual thickness of the 'pay' concentrated on the bed-

rock, which is 70 ft. below the surface. In frozen ground the best record is 1¼ cents per pan, or $1.70 per yard; this was the operating cost only, but it included thawing, mining, hoisting, and washing the gravel.

In the days before Columbus discovered America the ancient miners of central Europe employed the method known as 'fire-setting'. A big wood fire was built close to the face of a level, and when the rock had become thoroughly heated it was customary to throw water on the hot surface so that it cracked. When thus fractured, the ore was extracted by the further aid of hammers and wedges. According to Henry Louis, this method was in use in the Sala mines, in Sweden, as late as 1876, and in the Kongsberg mines, in Norway, it was employed up to 1884, when improvements in blasting caused the abandonment of the ancient practice.[1] I have seen many a face of an old level in the Alps, on the border of France and Italy, that was beautifully concave by reason of the application of this method. On the other hand, in the copper region of Michigan, the country is occasionally covered with a blanket of sand, wash, or gravel, which must be penetrated before the hard copper-bearing rock is reached. Sometimes the shaft breaks into a quicksand, making further sinking impossible in the ordinary way. Then artificial freezing is employed; the wet sand is frozen solid and kept in this condition long enough to allow the miners to make the necessary excavation and timber it securely. Thus man uses fire and frost, air and steam, wood and iron, in his subterranean operations, overcoming Nature in one place by the use of the very force she uses to resist him elsewhere.

Wood fires make smoke. The gases liberated are injurious to health. In the North, men soon learned to keep away from the shaft or drift until natural ventilation had purified the air. At best they had to work in a warm moist atmosphere, for they had to excavate the rock softened by thawing before it froze again. At surface the air might be 20° below zero; in the mine the conditions simulated a Russian bath.

After the pioneers in the North had used wood fires for thawing during one winter season or more, a clever operator hit upon the idea of employing steam for the same purpose. Then the 'steam-point' was introduced. It happened thus: In 1898 C. J. Berry discovered that steam could be directed to thaw frozen earth. The steam escaping from the exhaust of his engine had thawed a hole in the solid 'muck'. Berry noticed this and picked up the exhaust pipe, which was a rubber hose. On applying it to the frozen ground he found that it would thaw the muck so as to penetrate for the full length of the hose within a few minutes. This excited the men who happened to be watching the experiment. All of them at once began to devise a scheme for doing this work effectively. Thus the 'steam-point' was invented. A rifle barrel was chosen, then a small hole was bored into one side so as to admit the steam. This was then driven, with gentle taps, for its entire length into the frozen ground. In its rudimentary form the steam-point was a short length of iron pipe, pointed at one end, and attached to a length of rubber hose, through which steam traveled from a small boiler at the surface. The boiler was of the 'porcupine' type; a hollow shell with water-tubes projecting radially inward, through which the flames pass. The pointed end of the five or six feet of iron pipe was inserted into the frozen gravel and driven forward gently by taps from a hammer, as the ground was softened by the steam issuing from the orifice at the lower end. As finally developed, the steam-point became a specialized tool of great efficiency. A solid head was added to the end that is hammered and a protecting ring was welded to the forward end; the shank itself was made of hydraulic pipe of the strongest kind, and armored rubber tubing replaced the ordinary hose. The length of the 'steam-point' ranges from 6 to 16 ft., the usual size being 8 ft. This is driven home so as to make a hole about 6 ft. deep. The accompanying sketch will illustrate the details of construction. The hole in the steel head allows for the insertion of a bar, wherewith the point is turned so as to aid advance. As the operator hits the head with a hammer, he turns the point by means of a bar held in the other hand. The steel head is solid. The ring at the working end is welded on. The hose is attached at the inlet.



A Steam-Point.

As used two or three years ago, the cost of thawing was 25 to 30c. per cubic yard. With longer points, longer sweating, cheaper fuel, better system, the cost has been reduced one half. In a 20-ft. deposit, using 12 to 13-ft. points, it is possible to thaw 3½ to 5 cubic feet per point at each setting. One of the first to use the method systematically was J. M. Elmer, who erected a rough plant on the Discovery claim of Bonanza creek in the winter of 1898. He had two boilers of 50 hp. each, 60 points, and hose to transmit steam 25 to 100 ft. from the boilers. His points were 14 to 16 ft. long, that is, they sufficed to reach bedrock at that place. There was 4 ft. of frozen muck on top of the gravel. Each point thawed 5 to 8 cubic yards per 24 hours, the poorest work being 3 ft. square of bedrock to a depth of 15 ft., or 135 cu. ft., equivalent to 5 cubic yards.

Expenses per 24 hours included:

Wood—5½ cords, at $13.50	$74.75
Labor—3 men on two shifts	40.00

The thawing amounted to 400 cubic yards, so that

[1] 'On Some Unsolved Problems in Metal Mining.' By Henry Louis. Institution of Civil Engineers. 1908.

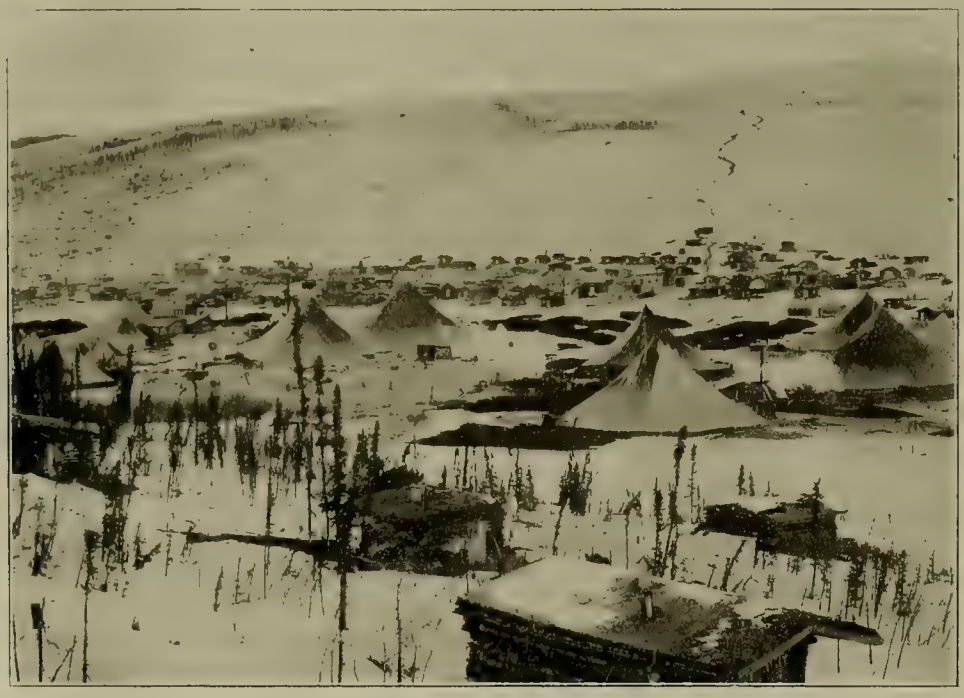
the cost was 28.5c. per yard. The plant cost $4000. Each point used steam equivalent to 1½ horsepower.[2]

The efficiency of a point will vary according to the pressure of steam, the length of the tool itself, the distance between the points, the time allowed for sweating, and the amount of moisture in the ground. An effort is made to fix the intervals between points so that their spheres of influence do not overlap. By allowing the steam sufficient time to do its work, the area affected is increased. This is the 'sweating' stage. As the amount of humidity, in the form of ice, increases, more steam is required to overcome the latent cold. The 'muck' that covers the surface consists of 75% ice and 25% organic matter. A large expenditure of steam is needed to make the thawing effective.

When the steam-point was introduced, the extraction of gravel from the drift-mines was continued in summer, as well as winter, and the production of gold proceeded concurrently, as long as the weather at the surface permitted. The dump accumulated in winter would freeze before spring, necessitating the employment of steam-points before it could be moved. Moreover, the boiler erected for the purpose of thawing was also used for hoisting. Larger buckets and a bigger scale of operation became possible.

During the first three years, from 1896 to 1898, at Dawson, the mining on the creeks was done by wood fire and windlass. Then came the 'steam-point.' In June, 1898, Clarence J. Berry put the first steam-scraper to work; his plant included a 4-hp. Atlas engine and a porcupine boiler, which had been used to propel a scow down the river. In the same year Berry also erected a boom-derrick on No. 5 El Dorado. This was the first rig of the kind erected in the Klondike district. By the aid of this derrick the gravel was hoisted to the sluice-boxes, with a saving of 50% in the cost of operation.

In the early days of mining in the Klondike, when the frozen ground was conquered with wood fires, the 'creeks' must have looked like an inferno. If you had gone up the narrow valleys of Bonanza and Hunker during the long twilight of the arctic winter ten years ago you would have seen a picture worthy of Gustav Doré. There was no noise, for there was no machinery; there were no whistles to announce the noon hour or the evening rest; there was no drilling in hard rock nor cheerful hammering. A weird silence brooded over the waste of snow. The gloom was thickened by a pall of smoke escaping from holes in the ground, whence an occasional figure issued. Not many men were visible, for they were below in the rabbit warren of their diggings. At the top of a shaft, here and there, a weary gnome might be espied turning a windlass and emptying buckets loaded with dirt that came from a small pit beneath. The flare of red fires parting the twilight marked the beginning of the work of shaft-sinking. The snow, the moss, and the fog muffled every foot-fall, deadened every sound. It looked like hell—but it was freezing.



Cleary Creek, Near Fairbanks.

[2]For these data I am indebted to Mr. A. J. Beaudette, the Territorial Engineer at Dawson.

AMALGAMATION METHODS.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. MACFARREN.

There is found a wide divergence in the ideas and methods of different amalgamators, and the subject of amalgamation should receive more attention, especially in these days when leaf-filters, all-sliming, and crushing in solution are so much in vogue. Amalgamation, where possible, is the money-making end of milling gold ores, yet men of technical attainments are passing it by lightly. Rarely do we find a college graduate serving his apprenticeship today on the battery. There are those who advocate fine grinding of the original ore for cyaniding, but, as some South African metallurgists have said, if we allow a flake of gold to pass the plates and go to the cyanide plant, we can get only 95% of it, as against the total we would have if caught on the plates. We are advised that with the new filtering devices we should be able to save close to the dissolving limit, but those who have seen the many bad and ruined charges, the leakages and runaways, and the accidental washing with a 'wash-solution', the stock of which builds up so rapidly in value that it must be sent to the zinc-boxes every two or three days, are still unconvinced that it is not best to catch as much as possible by amalgamation.

A striking difference is found in the condition of the plates as maintained by different amalgamators. Some keep the apron-plates quite hard, even to the verge of the amalgam breaking away, and the lower plate becoming blue, for the purpose of preventing the quicksilver from working down the plate into the mercury-trap and eventually into the creek below. Others keep the amalgam soft and plastic, sometimes overfeeding quicksilver to the extent of working down and off the plate and so becoming lost. A coarse, easily amalgamable gold will be readily caught on a hard plate, but fine gold requires a soft plastic bed of amalgam. Whisk a particle of hard amalgam over a hard, dry amalgamated surface and it will probably not be caught; then brush it over a soft wet spot and notice how quickly it catches. We have an analogy in nature, in the case of a snowflake blown across a sheet of ice; given a sheet frozen hard and the flake will not catch, but given a soft plastic sheet, on the verge of melting, and the flake will easily be arrested. If the sheet of ice were inclined it would be in the same position as an apron-plate, and by keeping them soft we have the best catchers, but if we overstep the narrow margin of safety the water or the quicksilver will run off, carrying with it the precious flakes with which it has combined—and here is the difficulty with soft amalgamation. Given an easily amalgamable ore, the mill-man may incline toward hard amalgamation, and save the greater attention and time required when soft amalgamation is practised.

Careful amalgamators who use considerable refinement in their methods, dress the apron-plates with a rag, taking a little amalgam off daily with the rag, entirely eschewing the use of a rubber, and taking no more on 'clean-up' day than at any other time. They keep a good bed of amalgam on the first plate, and less on the second; after rubbing the quicksilver well in and getting an even texture across the plate, with any surplus amalgam pushed up to the head, they smooth down the amalgam by riffling or roaching across at right angles to the flow of the pulp, with a whisk-broom. They aim to feed quicksilver hourly through the mortar, in such a quantity that very little will be needed in dressing the plates, and yet not enough to cause the brush lines to run or disappear. The amalgam on the upper apron-plate should be of such a consistence that it can be pushed up with the finger and remain without flattening out. In appearance this amalgam should look neither hard and dead, nor like a mirror, but should have a white frosted surface. The lower plates should be watched. The quicksilver and amalgam should not run down upon the lower plates. When any gold is caught on the last apron-plate, investigation is necessary. The practice of riffling or roaching across the soft amalgam has been condemned, on the ground that these riffles catch the fine iron and steel and the sulphides. The fact that these tiny grooves do this speaks well for their function in catching gold. However, these riffles can be avoided by smoothing down the amalgam with a fine-haired paint or kalsomining brush. Care should be used that all the particles of amalgam are bedded down.

Chisels, scrapers, and pumice stone should not be used on apron-plates unless the amalgam becomes so hard that it cannot be removed in any other way, and it is well to avoid the amalgam becoming as hard as that. Sweating plates is dangerous on account of salivating the workmen. In Australia the laws prohibit approaching a sweated plate until the lapse of a certain length of time, which practically renders the 'sweat' of no avail. Turn up the edges of the apron-plates and slip the ends well under one another, and the quicksilver will not work through the table to the floor. Drops between plates are in favor, as the amalgam seems to pile up at the drop; this is mainly due to too much quicksilver being fed, or the plate being cleaned so close that there is no amalgam remaining to act as a 'binder' for the quicksilver. There should be a drop between the first and second plate, but others are superfluous, since but little should get below these plates. These drops interfere with quick dressing of the plates. A drop of one-half inch is sufficient; more than three-quarters is liable to scour. Foundations for the plate tables should be carried up from the ground, so as to be as independent of the mill-jar as possible, as it causes the quicksilver to separate out of the amalgam. In starting a new plate, run some low-grade coarse gold ore through until the plates take on a layer of amalgam. New plates washed with quicksilver do poor work, and consequently 'skin-tight' clean-ups should be avoided, unless some of the amalgam is returned to the plates.

Occasionally a man is met who takes the amalgam off his apron-plates only monthly or semi-monthly, who has a water-drip at the head of them, and who has his amalgamators feed quicksilver by a chart. With him is likely to be found the man of secret

'dopes' and nostrums. Use as few chemicals as possible. A little lye to cut the grease is good, also nitric acid solution for pickling the quicksilver. The quicksilver is sometimes 'loaded' by first freeing from all adhering moisture and then adding metallic sodium in small lumps until the quicksilver just commences to amalgamate a bright nail. It is but little used by practical mill-men, as it renders the quicksilver so active that the amalgam freezes to the iron or steel surface of the mortar, while so much fine iron and steel and sulphide are caught by the plate-amalgam that these surfaces become foul. It can be used to advantage in starting new plates or in covering bare spots. Cyanide appears to do more harm than good; being used as a strong solution, it is injurious to the hands of the workmen, allows the quicksilver to be rubbed into the copper, and the benefit it gives is only temporary, as the plate eventually becomes still harder. Plates that have been continually treated with a strong cyanide solution are difficult to handle, especially if little amalgam is kept on them, and that in a hard form. This trouble is manifested mainly by the quicksilver coming out in globules and running down the plate. Bare spots are often treated by softening with strong cyanide solution and then rubbing amalgam in, but in most cases the spots are soon bare again. It appears better to cover the bare places by coaxing the deposition of amalgam from the edges toward the centre, just as nature covers an open wound by growing the skin or bark from the edges of the cut to the centre. To do this, brighten the copper by burnishing with a little fine grit and then pushing the adjacent amalgam over and rubbing it well in.

The tail-box of all apron-plates should be fitted with what is known as a 'treasure box'. This is simply another compartment in addition to the one collecting the pulp for the launder; a swinging lid or door enables the pulp from the plates to be directed to either compartment. The plate is washed down with a heavy stream of water, preparatory to dressing, into this second compartment; after dressing, the plate is again washed down, this time with a light stream. The function of the 'treasure box' is to catch the particles of loose amalgam that might otherwise be lost, and also the rich sulphides that have attached themselves to the plate by reason of the amalgamating of an exposed face of contained gold. This box is very necessary when running on rich ore. A portable trough that can be temporarily placed below the edge of the plate is sometimes employed.

The use of inside plates is a matter of individual preference. Some claim they should not be used; that they place the amalgam where it can easily be scoured off and lost, should the mortar overfeed. Others claim that in some cases fine gold can be caught by their use, that cannot otherwise be saved. All are agreed they should not be used if the same saving can be made without them. It is usual with many amalgamators to use an inside plate when running on rich rock, with the idea that the less the amount of amalgam to be handled on the plate, the less the loss will be. The common form of a curved chuck-block is wrong, as the curved part, or belly, is in an excellent position to be scoured; on opening a mortar that has run choked for some time it will often be found that this upper curved part is scoured, sometimes down into the copper. Take a 2 by 6 in. piece of sugar pine and rip it diagonally across the end, making two triangular sectional lengths; attach one of these to the usual strip that rests in the screen-slot by bolts a foot or more apart, using a strip of iron in connection with these bolts, to hold the lower edge of the copper-plate in position, and as a protection against it becoming torn loose. Scouring can largely be prevented by protecting the plate with a No. 4 mesh screen of heavy wire, spaced from the plate by a nut on the bolt which attaches this screen to the chuck-block. A back-plate can be used in a narrow mortar, if it can be set 6 in. above the dies, and bolted through the mortar. This plate should have two sets of bolt-holes, so that it may be adjusted to the wear of the dies. Inside plates must be carefully watched, especially on starting, and no bare spots must be allowed; they tend to spread like a rotten spot in an apple. At all times the feed must be kept just right. They should be kept hard, using the lip-plate as the indicator in feeding quicksilver.

The lip-plate should be wide, 12 or 15 in., if possible. Splash and other outside mortar-plates are a matter of individual opinion. There should be as large a surface here as possible. The usual conditions under which work is done today are with a fine-grained gold, a low-grade ore, and a large capacity —necessitating a narrow mortar and a low discharge, thus prohibiting the successful use of inside plates, or of catching much gold in the mortar-sands. This leaves only the outside mortar or lip-plates, and the apron-plates. The amalgam on the mortar-plates is in a hard form, not likely to run or slough off, and here is the place to hold it—a better place than on the inside plates, but not as good as the mortar-sands. The apron-plates are reserved for catching the gold that has escaped higher up. These mortar or lip-plates are scraped at intervals varying from a few days to a month, according to the richness of the rock.

The mill-man may experiment with a plate in the tail-box, the launder, and on the concentrators, but they must be dressed occasionally. Patent amalgamators to follow plates may be of advantage in some cases, but usually not, as it is the amalgamator's business to see that there is nothing left that can be caught by amalgamation, consequently they should only be put in on trial.

The practice of cleaning the removed amalgam on one of the apron-plates is bad for various reasons, although when the 'treasure box' is used, the loss of gold is small. The easiest way to clean the amalgam is to place it in a large gold-pan with an amalgamated bottom, on removing it from the plates; then, when at leisure, work it up on this amalgamated surface at the clean-up sink, catching the refuse and periodically grinding it up with quicksilver.

Where difficulty is experienced in amalgamating the gold, it is well to increase the grade of the apron-plates and use less water in the mortar. For a coarse, easily amalgamated gold, long apron-plates

are unnecessary, though they may be required with fine gold or where an excess of water is used. Given a long plate, where the gold is practically all caught on the first few feet, there is on a large part of the plate a condition akin to that when running through a large tonnage of poor ore, where it appears that there is not sufficient metal plated to prevent loss, probably by attrition. No exact reason can be given for this poor work with extremely low-grade ore. It is analogous to what occurs in the zinc-boxes when a large volume of solution of low gold content is allowed to run through. This condition may justify using a little rich ore to sweeten the mill-feed. Long plates may be of advantage where a distributing or collecting box at the head of the apron-plate is utilized to turn the pulp down one-half of the plate while the other half is being dressed, thus saving the labor involved in hanging-up and the loss of duty from stopping the battery. Every mortar should be built so that one of these boxes can be bolted to it, if desired, as they are convenient for using a wide lip-plate. They distribute the pulp evenly across the plate in case of an irregular discharge from the mortar due to the bad order of drop or to other cause. They also form a projecting lip over the plate-table, preventing leakage, and they reduce jarring of the table by close contact with the mortar. Where no distributing-box can be bolted to the mortar, the plate-table can be set a few inches below the mortar-lip to permit a wooden box being inserted for catching the flow. At the Empire mill, at Grass Valley, the tables are fitted to the mortars in this way, and when dressing a plate, a trough of sufficient length to carry the flowing pulp to the plate of an adjacent battery is used. These methods should only be practised if tests show that the tailing is only a little higher while the plate is carrying an overload.

With individual stamps, outside amalgamation is usual, although quicksilver has been successfully fed to the mortars. As these stamps require much water, a half plate should be fitted to each stamp, or a full-width plate to two stamps built together. The placing of two plate-tables to take the pulp from three individual stamps built together has not been a success on account of the inability to distribute the pulp evenly across the width of the plates. Too often in outside amalgamation the plates are dressed too wet, and then allowed to become hard before dressing again. This trouble can be avoided by sprinkling a little quicksilver from a bag or bottle upon the dry spots at the head of the plate, without stopping the battery, but it must be done carefully. Outside amalgamation is interesting and offers excellent opportunity to study plate-work. On many ores it will be found possible to stop nearly all the gold on the first 12 in. of the upper plate, if quicksilver is dropped upon it as needed. When quicksilver is not supplied as required, and the plate becomes hard and coated, as when treating rich ore, the gold will tend to slip over and be caught farther down, while if too much quicksilver be used, the amalgam will run down, which is probably worse.

Amalgamation in cyanide solution presents no difficulties, within the requirements made of it. As the solution usually does not exceed one pound per ton in cyanide strength, it does not cause the plates any harm. Neither does it injure the hands of the workmen, though it may make them rough at times. A good remedy for this is to rub Albany grease into clean hands, and to work with gloves so as to allow the grease to remain on as long as possible. As the life of plates in solution is limited to from six to nine months, the devising of means for prolonging their life offers an excellent field for investigation. With silvered copper plates costing approximately $2 per sq. ft., the item for renewals is important. When amalgamating in cyanide solution, the plates will be eaten through in spots, and yet it may not be convenient to put in a new set; consequently it is necessary to build plate-tables that will prevent the quicksilver from working through. This can be best accomplished by using 2 by 4 or 4 by 4 in. planed, well seasoned lumber, the length of the table, put together with tar of paraffine paint, and bolted tightly across the width of plate every 3 ft. If drops are used, do not allow the edges of the plates to project beyond their wooden backing, as they are gradually eaten down to dangerous knife-edges.

Radium.—The difficulties attending the estimation of radium in rocks and other materials leave still a large balance of certainty—so far as the word is allowable when applied to the ever-widening views of science—upon which to base our deductions. The emanation of radium is most characteristic in behavior; knowledge of its peculiarities enables us to distinguish its presence in the electroscope, not only from the emanation of other radio-active elements, but from any accidental leakage or inductive disturbance of the instrument. The method of measurement is purely comparative. The cardinal facts upon the strength of which we associate radium with geological dynamics, its development of heat, and its association with uranium, are founded in the first case directly on observation, and, in the second, on evidence so strong as to be equally convincing. Recent work on the question of the influence of conditions of extreme pressures and temperatures on the radio-active properties of radium appear to show that, as would be anticipated, the effect is small, if indeed existent.—JOHN JOLY.

No one factor has contributed more to America's industrial supremacy than the rigid policy of 'scrapping' out-of-date machinery. If a new form of motor comes out tomorrow, in the use of which the power bill is cut 10%, the consumer, and the engineer who advises him, want to know all about the motor immediately. The advertising display draws the first attention; it is filed, and correspondence then brings further data. The policy of 'scrapping' what is obsolete in machinery has a close parallel in what an engineer should do with the record of obsolete practice that fills his library. The step advocated, standardization, will make the process of weeding out and 'scrapping' the easier and simpler; the obsolete can be put aside in separate binders on the top shelf.

OIL PROSPECTS IN NEVADA.

During the early part of November, 1908, an examination of the oil prospects in Nevada was made by Robert Anderson, of the U. S. Geological Survey. We are in receipt of his preliminary report:

The hills west of Reno, to the north and south of the Truckee river, are composed of a thick series of unconsolidated beds of sand, clay, diatomaceous earth, volcanic tuff, and gravel, dipping eastward and northeastward away from the mountains at angles of from 15 to 35°. These beds have been called the Truckee beds. They overlie andesite lava and older igneous and metamorphic rocks, such as form the mountains to the southwest and northwest, and were laid down upon them as sediments in a fresh-water lake that covered much of this portion of Nevada during Middle Tertiary time, when the region was much less mountainous than now. Subsequent to the deposition of these beds, mountain-making forces had produced the surrounding mountains and had tilted the beds up into their present attitude, besides fracturing them throughout with an intricate system of dislocations. Later periods have witnessed likewise a great amount of erosion of the mountains and hills, the presence of other lakes, and the deposition of a comparatively thin covering of sand and coarse gravel over most of the hill and valley area around Reno.

If petroleum were present it would with little question have to be considered as originating in the Truckee beds, and there, if anywhere, it would be stored. The examination of these beds has resulted in the conclusion that no paying quantity of petroleum, if any at all, will be found in them, for the following principal reasons:

First. No indication of the presence of oil has been discovered in the beds at the surface, although they are tilted and the succession exposed as a whole in such a way that some of the oil, if any were present, could hardly fail to escape to the surface and leave a trace. Moreover, the completely permeating system of small fault-fractures would lend further avenues of escape. The supposed indications of oil that have been reported by previous observers are iron, manganese, and vegetable stains in certain strata and occasionally on the surface of standing pools of water in the vicinity.

Second. The structure of the beds is that of a monocline of considerable dip, at the base of which the oldest beds of the formation are exposed overlying the volcanic rocks of the mountains. The summit of the anticlinal fold, which probably once arched over toward the west into the southwest-dipping strata of the Verdi region, and which would have afforded the best conditions for the accumulation of oil, has been completely removed by erosion. The tilted, erosionally truncated, and intricately faulted condition of the strata would favor the diffusion and escape of the oil, if any were present, rather than its accumulation in large quantities.

East of Wabuska, the examination was confined chiefly to the basin-like valley in which the Yerington Oil & Gas Co. is drilling a well, north of the great northerly bend of the Walker river and about eight miles eastward from Wabuska. This valley is typical of a number of similar basins in this region that form elbows in the valley of the Walker river.

The basin is surrounded by mountains formed chiefly of lava and volcanic fragmentary matter, and has a fairly level floor with surface covering of loose sand and compact clay. Horizontal strata of unconsolidated sand and clay, and detritus from the mountains, have accumulated in this basin within a comparatively recent (Quaternary) peroid of geological time, probably nowhere to a depth exceeding a few hundred feet. The shallow and local nature of this filling is indicated by the fact that little knolls of the lava that forms the bedrock of the valley, occasionally rise above the floor, in some cases very near the river. The chance of finding oil in this vicinity must be considered very slight, for the reason that there is no evidence of the presence of any strata that might be looked upon as probable oil producers.

The portion of Smith valley that was visited was the northern part, extending from a line drawn eastward across the valley from Hinds' Hot Springs northward to Buckskin. The mountains on the east of Smith valley are formed chiefly of much altered limestone intruded by granite and rhyolite and capped with andesite lava; those on the west, chiefly of granite and porphyrite igneous rocks. The valley itself contains a filling of horizontal lake-beds of unconsolidated clay and sand, which are exposed in low bluffs at the edge of a terrace on the side of the valley. These beds probably belong to the late Tertiary period, when a lake must have covered the valleys of this region. The beds do not date so far back as those in the vicinity of Reno. They are locally overlaid ty talus and alluvial fan deposits at the base of the mountains, and by a comparatively thin coating of recent sand and clay deposits that have been laid down over the floor of the basin. No definite estimate can be made of the depth of the sediments in this valley, but it may be said that they aret probably underlaid at a depth of not very many hundred feet by the volcanic rocks or older bedrock series. The geologic character of the region is not such as to favor its selection as a possible petroleum producer.

A brief examination was made of an asphalt prospect in northeastern Nevada, about 15 miles south of Palisade, near the foot of the mountains east of Maples' ranch, on the Eureka & Palisade railroad. At this locality a lustrous black asphaltite, resembling in character the variety called impsonite, occurs in veins and stringers along fracture planes and as sheets along bedding planes in well indurated calcareous and clay-shale and sandstone beds of Carboniferous age. The lenses of asphalt are variable in size and occurrence. The greatest width of any ore observed in the prospect openings is about 18 inches. The asphalt cannot be traced on the surface of the ground, but similar material occurs at different points several miles distant, and it is probable that the zone of fracturing in which it has collected has considerable extent.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

IMPROVEMENTS ON ONE MINING CLAIM NO AID TO OTHERS.

The sum of $132, allowed for improvements on one mining claim made in a year, was sufficient to prevent a forfeiture of such claim, but would not prevent a forfeiture of other claims in a group, upon which no improvements were made.

Fredricks *v.* Klauser, (Ore.) 96 Pac. 679, July, '08.

LOCATION OF MINING CLAIM—DISCOVERY.

To constitute a valid location, there must be such a discovery of mineral as that an ordinarily prudent man, not necessarily a miner, would be justified in expending his time and money thereon, in the development of the property. While mere possibility that ground claimed contains gold, or that there are mere indications of the existence of minerals in the ground, is not sufficient to justify a prudent person in expending money and work in exploration of it, yet where the evidence shows the actual existence of gold in the claim, the locator is entitled to strengthen the proof upon any of the elements which enter into what is comprehended by discovery. He may supplement the showing that mineral actually did exist, by proving, as a ground of justification for the expenditure of money and time, that the adjacent ground in the same gulch is rich in the same material, or that adjacent claims were developed into paying mines after development upon similar showings of mineral, or that geological conditions are so similar that, from the character of the mineral discovered, it is reasonable to expect to find mineral in valuable quantities in the exploitation of the alleged claim. But there must be an actual discovery of mineral within the limits of the claim before a valid location can be established.

Cascaden *v.* Bortolis, 162 Fed. 267, May, '08.

SUBSCRIPTION TO MINING STOCK—PAYMENT—RECOVERY.

A purchaser who paid cash for shares in a prospective mining corporation, where the project was finally abandoned after an adverse report by experts, had no right to recover the sum paid, where all the parties treated the stock to which they would be entitled as the measure of their interest in the venture.

Clark *v.* McManus, (Minn.) 117 Northwest. 476, July, '08.

MINING COMPANY—PURCHASE OF MINING GROUND.

The statute of California prohibits a mining company from buying any additional mining grounds without the approval or ratification of the stockholders. Under this statute, in order to raise the question of the validity of a purchase by a mining company, it is necessary to prove that the land purchased was additional mining ground.

Greve *v.* Ocho Oil Co., (Cal. App.) 96 Pac. 904, July, '08.

OIL LEASE—NATURE AND CONSTRUCTION.

Oil leases stand on a different basis from ordinary leasehold agreements, for the reason that the work which is to be done is ordinarily of an experimental and speculative nature, and if oil is not found no estate vests in the lessee. The rule that forfeiture or abandonment is not looked upon with favor is not applied to an oil lease.

Conklin *v.* Krandusky, (N. Y.) 112 New York Sup. 13, July, '08.

OIL LEASE—ABANDONMENT.

Under an oil lease for 15 years, and as long as oil should be found in paying quantities, the lessee drilled a well but found no gas; he afterward removed all the drilling machinery and tools, except the casing in the well, and did no other drilling for more than ten years; this was held to be an abandonment of the lease.

Conklin *v.* Krandusky, (N. Y.) 112 New York Sup. 13, July, '08.

Commercial Paragraphs.

L. H. WYGANT Jr., is with the Morse Bros. Machinery & Supply Co., Denver, Colorado.

The BRAUN-KNECHT-HEIMANN Co., San Francisco, announces that its sales for November, 1908, were double those for the same month in 1907.

The THOMPSON BALANCE Co. has moved its office and factory to 808 Twentieth St., Denver, Colo., where it will have a new and commodious factory for the manufacture of Thompson balances.

THE LUNKENHEIMER Co., Cincinnati, announces that it has recently received an order from the Isthmian Canal Commission for 7000 globe and angle valves, ranging in size from ¼ to 3 inches.

The WESTERN ENGINEERING & CONSTRUCTION Co., San Francisco, is distributing a pamphlet containing two good photographs of dredges built for use at Oroville. It is a novel and attractive idea in advertising.

GRANT W. SPEAR, who for many years has been vice-president of the Dearborn Drug & Chemical Works, at Chicago, took charge November 1 of the Eastern offices of the company, at 299 Broadway, New York City, as vice-president and Eastern manager.

THEODORE ALBERT was recently elected president and treasurer of the Wm. Powell Co., of Cincinnati, Ohio, to succeed the late James Powell. The new management has long been identified with the company and will continue to uphold the high character of the Powell Co.'s steam specialties.

The WAGNER ELECTRIC MFG. Co. announces the appointment of John Mustard as assistant manager of sales for the East, including Pittsburg and territory east thereof, with headquarters at Philadelphia. Mr. Mustard has been with the Wagner Electric Mfg. Co. as district manager, at Philadelphia, for the past 15 years.

THE AGUACATE MINES, Inc., at Quebrada Honda, Costa Rica; via Port Limon, via San Mateo, desires catalogues descriptive of any and all kinds of mining, milling, and electric machinery and supplies. The plans include a 100-stamp mill, a 2000-hp. hydro-electric power-plant, aerial trams, a four-mile electric tram road, compressors, drills, cars, and all auxiliary machinery.

THE PACIFIC EQUIPMENT Co., dealers in new and second-hand mining, railway, contractors' and oil-well machinery, has established offices in San Francisco, Los Angeles, and Seattle. The president, J. W. Pike, for many years has been, and is now, interested in various mining enterprises. The manager is W. A. Desborough, formerly with the West Coast Machinery Co., and the Joshua Hendy Iron Works of San Franciso.

The SULLIVAN MACHINERY Co. announces that Sullivan rock-drills, air-compressors, and hammer-drills are now carried in stock at Spokane, Wash., by the United Iron Works Co. The same company also represents the Sullivan Machinery Co. at Seattle, and will carry a stock of drills, compressors, and supplies, at 109 Main street. Austin Y. Hoy is the representative of the Sullivan company in this territory, with headquarters at Spokane.

Catalogues Received.

THE C. O. BARTLETT & SNOW Co., Cleveland, has recently published its Catalogue No. 27, describing screening machinery.

The WM. H. HOEGEE Co., Inc., Los Angeles, is distributing a set of handsomely illustrated catalogues called: No. 12, Guns and Ammunition; No. 14, Tents and Camping Goods; No. 15, Outing Suits and Boots; No. 17, Women's Catalague—riding, fencing, hunting, and outing costumes.

THE WESTERN ELECTRIC Co. has just issued a little booklet called 'Pointers on Power,' which discusses the question of individual machine drive by the use of induction motors, and shows it to be particularly advantageous in places where inflammable dust, gases, or oils are present.

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EDITORIAL.

IN ENGLAND, Mr. Andrew Carnegie's later philosophy is contrasted amusingly with his earlier career. *The Financial Times* quotes from Mr. Carnegie's article in *The World's Work* where he says: "It is a low and vulgar ambition to amass money." Thereupon our London contemporary is reminded of the small boy who, after a sound chastisement, was thus addressed by his father, "Now, Tommy, understand that this is for your own good. Remember what the great Solomon said, 'Spare the rod and spoil the child.'" "Yes, I know," sobbed the little delinquent; "but Solomon didn't say that till he was growed up!"

TO BE ABLE to select a good foreman is the first step to success as a mine manager. The foreman and the shift-boss do not figure in the printed reports or other records of a mining company, and the average director fails to appreciate the real importance of these humbler members of the staff, but, to tell the plain truth, the cost of mining and the finding of ore are largely in their hands. Complete sympathy and cordial understanding between the superintendent and his foreman, as well as between the foreman and his shift-bosses, is an excellent preventive of labor-troubles and a notable stimulus to efficiency in a mine.

TO Mr. J. B. Lippincott and Mr. W. C. Aston belongs the honor of having broken the American record for rapid tunnel-driving. First place had been held by the Gunnison tunnel, in Colorado, the rate there having been 449 feet in one month. At the Elizabeth Lake tunnel, in southern California, a speed of 466 feet has been attained. Even more significant is the fact that this work, constituting part of a municipal engineering enterprise for bringing water from Owens river to Los Angeles, was done far below the estimated cost. The engineers' forecast had been $66 per foot; the actual outlay was $35.81 per foot, with a cross-section 12 feet square.

WE ARE INFORMED that Mr. Edgar Taylor, of the firm of John Taylor & Sons, has been elected President of the Institution of Mining and Metallurgy, at London. The election is made by the Council, which is a representative body, therefore the presidency is properly deemed a great honor. We take particular pleasure in saluting Mr. Taylor as titular chief of our profession; he is well worthy to represent the English-speaking mining engineers, for his own honorable career is the sequel to a family record that now covers the lives of three generations of Taylors. It is not too much to say that the continuity of professional labor and business activity

marking John Taylor & Sons places that firm in a unique position. Mistakes they have made, like other men, but nothing sordid has ever stained their professional reputation, and in a period when men have been willing to sacrifice everything to the mere making of money, this firm has stuck to the right principles inherited from John Taylor and Richard Taylor, grandfathers of the men now in control. There are hundreds of mine managers and engineers in different parts of the world that have been associated, as their fathers before them, with John Taylor & Sons; to all of these it will seem a fit and proper thing that one of that name, and a man that has added lustre to the name, should be chosen as President of the most representative of mining associations.

EDUCATIONAL institutions invested with power to confer degrees are under moral obligation to maintain the dignity of those insignia of intellectual labor. Manifestly a college or university that offers courses that do not lead to degrees cheapens the value of its diplomas. The short courses in assaying, metallurgy, electricity, and the like give essentially an artisan training; they educate men not for professional work but for a trade. The place for such instruction is in technological high schools. The artisan is worthy of high regard and he has a right to be considered in the general scheme of education, but he should not be trained under conditions that will confuse him in the public mind with the college graduate.

OUR FRIENDS of the Institution in London publish much valuable material, and they have done useful service in standardizing technical usage, therefore it is reasonable to expect that the publications of the Institution would illustrate the excellent preachments issued from Salisbury House. They do not. We remember something lately about a standard ton of 2000 pounds. Why then use the 2240-lb. ton? It may be too much to expect that the unnecessary plural, in such words as 'tailings' and 'concentrates,' shall be dropped, but why speak of "tailing analysis" and of "the accumulated tailings" on the same page? Also, why should "Buss tails" be abbreviated unpleasantly, while "Frue Vanner Tailings" suffers no elision? The use of 'head' and 'tail' in analyses of samples from concentrators recognizes the singular idea, which is not as singular as it seems, in virtue of which the unnecessary plural is dropped and a useful inflection preserved. The mill in which these things happened "consisted of 60 Cornish heads." That explains it all. Sidney Smith once told the vestry of Islington, when considering the proposal to lay wooden block-paving in their parish, that all they had to do was to put their heads together, and the thing was as good as done.

THE ADJUSTMENT of freight rates in an equitable manner is perhaps the most complicated single problem entering into the complex internal economy of the nation. The President has made strong suggestions on this subject which merit the serious attention of Congress. He proposes that the Interstate Commerce Commission should have summary jurisdiction over rates. This seems the only way to enable the Commission to achieve its highest usefulness. In Mexico this has long been the case, but the traffic commission in that Republic is representative of the people and also of the special interests at stake; in other words, the railroad corporations name members of the commission as well as the Government, although properly the Government holds the majority on the board. The most crying need of the people, as also of the transportation companies, is relief from the excessive burden of lower-class freight carried by the railroads, which either commands a higher rate than it should, thus oppressing and limiting industry, or is handled at a price that entails an actual loss upon the railways. The escape from this dilemma lies in earnest promotion of every feasible project for development of internal waterways. The report of the commission, now investigating these possibilities, should point the way to a new era of higher prosperity, for commerce responds directly to every fluctuation in the burdens of transportation costs. By relieving the railroads more and more from the unprofitable classes of freight, industry must necessarily grow at such a pace as to expand the carrying trade in higher-class articles, which can afford to pay remunerative tariffs. In following this line of development we shall only be extending the benefits to the people and to the railroads that have followed the utilization of the great water-route from Duluth to New York; and we shall be profiting by the experience of Germany in the canalization of her rivers; and by the early experience of England in her canal-building period, before she allowed her industries to be handicapped by rates that would cause an American shipper to collapse in amazement.

Smelter Smoke.

Smelter smoke troubles have assumed a new character in Montana. Usually there is general clamor for the decapitation of the goose that lays the golden egg. In Montana, however, the fumes are accepted more philosophically. It is the Government that appears as complainant, with the Presidential thunder rolling ominously. The forests are of more worth than any other interests, declares President Roosevelt, and he points to the sad plight of northern China and certain of the Mediterranean countries as examples of the irremediable disaster that follows in the wake of deforestation. The soil, with water to render it productive, is the fundamental asset of any community. The mineral wealth of a region must be great to admit of its continuance without the adjunct of agriculture at a reasonable distance. But Montana insists upon occupying a unique position that would absolve her from rigid application of the Presidential rule. The threatened proceedings against the Washoe smelter have aroused earnest protests from the citizens of Butte. They insist that the livelihood of 75,000 people must not be swept away, at least not by summary action. The consequent suffering would undoubtedly be extreme, and

it is gratifying to learn that no precipitate course will be pursued. A commission will be appointed to investigate. Meanwhile the question of suppressing the smoke-nuisance should seriously engage the attention of the smelting companies. Important and only partly explored phosphate belts exist in Wyoming, Utah, and Idaho. It would be wise systematically to prospect these deposits, in the hope of finding a basis for consuming large quantities of sulphuric acid. At the identical moment when such investigations seem urgently needed, the phosphate areas in the West have been withdrawn from entry and location, under executive order, the avowed purpose being to re-classify the lands in question, in order to restore to agricultural entry such portions as are found to contain no phosphate. This action may be technically defensible, but it can only serve to retard the development of an industry that would afford the smelters an incentive for conversion of fume into sulphuric acid, and by so doing protect great enterprises already established. The only other recourse for the smelters, in an effort to utilize sulphuric acid on a large scale, is to manufacture ammonium sulphate, a salt also useful as a fertilizer. Ammoniacal liquors would be available in large amounts if the coke makers in Montana, Utah, and Wyoming would introduce by-product ovens. Fertilizers are not in large demand in the West today because of their cost. The smelters can produce them cheaply, thereby contributing to the welfare of the farmers in high degree, and aiding the work of beautifying the land instead of rendering it barren.

The Mountain Copper Company, under the brilliant guidance of Mr. Lewis T. Wright, was the pioneer in effective suppression of smelter smoke in America. The problem consisted, as always, in finding a means for utilization of the sulphuric acid produced. Mr. Wright solved it by investigating the phosphate resources of the Middle West, which had hitherto been neglected. A further advance in the application of sulphuric acid was made at these works in the production of lime sulphate containing from 5 to 10 per cent phosphoric acid. Such material, of course, would easily displace ordinary landplaster in the local market. The sulphurous acid in the smelter-fume at the works of the Mountain Copper Company at Point Lewis, on San Francisco Bay, has been reduced almost as low as that in the smoke from steam-power plants that use California crude oils as fuel. These oils for the most part contain 2.5 per cent of sulphur, and when burned with 50 per cent excess of air beyond the amount theoretically required they yield a flue-gas containing an amount of sulphur equivalent to about 2.1 grains of sulphuric anhydride (SO_3) per cubic foot. An air-consumption of no more than 50 per cent excess is regularly realized in well administered power-plants today, and tests on marine boilers in service, recently made at San Francisco, showed an excess of only 20 per cent. In such cases the sulphuric anhydride in the flue-gases would be nearly 5 grains per cubic foot. In spite of the success achieved at Point Lewis, the supervisors of Contra Costa county have just passed an ordinance restricting the amount of SO_3 in gases issuing from chimneys to 2.5 grains per cubic foot, and making violation of the ordinance a misdemeanor. The outcry against the smelters is manifestly a popular fad. While smelter-smoke has devastated large areas in many parts of the country, the earnest efforts to abate the nuisance are not appreciated. Anyone desiring popularity is sure of a sympathetic following if he starts a crusade against the smelter. The agitation is often the result of mere personal ambition, sometimes with the hope of graft. Speculators have been known to buy large tracts of land so situated as to be in the drift of smelter smoke for the express purpose of profiting by damage-suits. In Utah the Federal Court permitted the United States Smelting, Refining & Mining Company to operate its plant at Bingham Junction under a limitation of 0.75 part by volume of SO_2 per 100 parts of gas. The requirement of the Contra Costa supervisors is equivalent to only 0.15 part of SO_2 per 100 parts of gas. The British Alkali Regulation Works Act of 1906 places the limit of sulphuric anhydride in chimney gases at 1.5 grains per cubic foot, but copper and lead smelters are exempted from the application of this law, in deference to the need of sustaining those industries. They were not required to achieve the unattainable. The law, however, did include the zinc industry, showing by this discrimination an intelligent recognition of actual conditions in metallurgical works. For conversion into sulphuric acid by the chamber process a steady evolution of sulphurous gases is essential. This is obtained in the roasting of ores, but in the subsequent smelting of copper the gases vary within wide limits in their sulphur content. In zinc distillation no such difficulty exists, and the escape of highly sulphurous gases represents defective control of the roasting and acid-making departments. By the British act, sulphuric acid works are allowed 4 grains of SO_3 per cubic foot in the escaping gases. It will be seen that the regulation was framed as a result of careful enquiry into existing conditions by competent men. The law was not an iron rule to compel a universal observance of ideal conditions, but a well conceived adjustment to the conditions attainable by different industries; it recognized the need of industry as a means for earning a livelihood. In Germany the law is equally considerate of the rights of manufacturers to conduct their business under practicable regulations. Alleged damage must be proved, and the amount of sulphuric anhydride permissible in the air at the point where injury is claimed to have been caused by acid fume is 35 parts by volume in one million.

Agitation against the smelters has become a menace to one of the most important of American industries, and the public has become super-sensitive to the point of fancying inconvenience where none actually exists. We cannot settle the matter by national legislation, since the right to regulate extends down to the merest petty board of county supervisors, but the United States Government has now an opportunity to render a lasting service in this matter. The complaints against the Montana smelters can be turned into a blessing by the appointment of a com-

petent commission with a representation of distinguished scientists, attorneys, and business men, to investigate the question of damage done and feasible abatement of the trouble in a broad way, not with reference to Montana alone. The findings and recommendations of such a commission, followed by intelligent departmental regulations based upon them for rational protection of the national forests and of the smelting industry, would establish precedents that would settle the controversy wherever it has existed. These regulations would speedily become crystallized into case-law and set a limit beyond which local officials would not dare to go, as well as setting a barrier against unjust injunctions issuing from the lower courts. It would give the smelters a chance to live without being outlawed.

The Panama Canal.

Panama has always been pestilential. It has been a breeder of disease, physical and moral—we had almost said intellectual—since the days of Balboa. We can expend more millions on river and harbor improvements than are needed to build the Panama canal, and do it quietly, honestly, efficiently, but as soon as we touch Panama we are inoculated with the old distemper. Mr. William Nelson Cromwell has laboriously replied to his critics, but he has dissipated no suspicions. To be sure, we may be exceeding our privilege to enquire what sum the New Panama Canal Company distributed in liquidation to its shareholders. It doubtless gave them what was left after settling with the original company, paying its attorney, and providing for other unmentioned and probably unmentionable expenses involved in foisting its moribund concession and insignificant assets upon the Government of the United States. It is something of an impertinence to ask what the New Panama Canal Company did with the money. That is why we suggested that Panama even affects the intellect; the critics themselves lose the scent. What we may justly enquire, however, is the cause of that complacency in official circles at Washington, which led into the original engagement to pay $40,000,000 for what could have been bought in the open market for $5,000,000. We cannot forget the indecent haste with which the United States welcomed the puling infant Republic before it had been properly clad in the garments of statehood, nor that solicitous cablegram from the State Department to the midwife, on the day preceding the great event. When the Government of the United States becomes so eager to learn of a revolution that can be made effective only through its protecting power, none but an unsophisticated child can doubt the presence of those evil influences whose persuasion consists in the corrupting use of money. Evil odors have been noticeable whenever the Panama matter has been probed, however lightly. If we desire a first-class scandal to furnish 'scare' head-lines for the daily newspapers, manifestly a congressional investigation of the Panama imbroglio will produce it. We shall feel humiliated by the details of intrigue to establish an opera-bouffe republic, and the unblushing disregard of the Dickinson-Ayon treaty, entered into with Colombia to protect her against that very dismemberment that we ourselves finally effected. Most likely certain representatives of the people 'in Congress assembled' will feel called upon to emulate the recent example of Senator Foraker by taking shelter under technicalities and making explanations that do not explain. Perhaps, too, we shall at last learn the details of that corruption which led to the withdrawal of Mr. John F. Wallace from the control of operations on the Isthmus, with the President, as usual, under instigation from his friends, firing hot shot in advance of proper judicial enquiry. Perhaps, even, we may learn why Mr. Lewis M. Haupt, the most capable member, from an engineering standpoint, on the commission appointed to report on the alternative routes, abandoned his objections to Panama, that the report might be made 'unanimous'. We do not impute corruption to Mr. Haupt, for the world knows that he is superior to base allurement, but we believe that, instead of following the dictates of his judgment, he wavered in his obligations under an appeal to patriotism, and was diverted to the oblique path under representations that it would promote the good of the greatest number.

That engineering difficulties exist at Panama no one can deny. The engineers cannot state that they know all the conditions to be met in building the great Gatún dam. There are rumors of vast slides into the cut on the mountain section; we recall that M. Charles de Lesseps encountered the same difficulty, and wrote a pathetic letter to his father on the subject. He did not see how he could take care of a whole mountain that persisted in sliding into the excavation.

But we are committed to the Panama canal. With all the scandal, and all the difficulties, and regardless of cost, we will have it. We must have it to relieve the trade-tension between the East and the West, to establish that commercial equilibrium which can only result from cheapening the transport of low-priced bulky commodities, between the Atlantic and Pacific States. The political solidarity of the Union requires that one portion shall not be overwhelmingly devoted to manufacturing and another essentially to the production of raw materials. The financial and political welfare of the nation necessitates a distribution of industries. Until there can be cheaper exchange of goods on which time in transit is not of prime importance, the West and the East must be out of balance in an industrial sense. The trans-isthmian canal will correct this, and the duty of Congress is clearly to forward the enterprise by liberal appropriations. Though miasm may arise upon stirring the morass of past intrigues, the present work must not be curtailed. Investigation is proper enough, but the digging must continue. The canal can be built, the difficulties can be overcome; our engineers have the wit and skill to triumph over natural obstacles, if the financial sinews be given with sufficient liberality. Let it be understood that an enterprise of this kind must be pushed unremittingly on an adequate scale, or what has already been done is as good as wasted.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

F. W. Baker is at New York.

J. Morgan Clements is at Cobalt.

Walter Fitch is now at Salt Lake.

W. F. Ferrier is on his way to New York.

D. W. Brunton was at New York recently.

Thos. H. Leggett is at Oroville, California.

Thomas B. Stearns, of Denver, is at New York.

Bartleit L. Thane has returned to Juneau, Alaska.

Albert Burch has returned from the Coeur d'Alene.

George T. Coffey is expected at Seattle from Dawson.

E. Seaborn Marks is on his way to the Malay States.

George A. Sonnemann, of Spokane, is in San Francisco.

F. F. Sharpless has returned to New York from London.

Edwin C. Holden attended the Mining Congress at Pittsburg.

R. H. Campbell has returned to San Francisco from Seattle.

H. R. Norsworthy, lately at Tintic, Utah, is now in San Francisco.

Antony J. McMillan has returned to London from Rossland, B. C.

J. Nelson Nevius has left Pasadena to examine mines in Lower California.

H. A. Shipman has opened an office at 200 McPhee Bdg., Denver, Colorado.

G. A. and H. S. Denny have opened offices in the Quirk Bdg., Mexico City.

H. N. Spicer, of Denver, is inspecting mines in the Black Hills, South Dakota.

Elwyn W. Stebbins has been to Nevada City, California, on professional work.

J. H. Weddle has gone to Costa Rica, to take charge of the Montezuma mines.

D. J. Pullinger, of London, is spending a month at Ventanas, in Durango, Mexico.

Dwight E. Woodbridge, of Duluth, was in San Francisco, on his return from Arizona.

Henry F. Lefevre is now in Oregon, making an examination of mines near Sumpter.

J. W. Finch and C. S. Thomas, Jr., have formed a partnership, with offices at Denver.

F. C. Roberts is spending Christmas at his home at Berkeley, having returned from Mexico.

Walter J. Stanford is on his way from London to the Yenisei copper mines, of which he is manager.

C. E. H. Hamilton, manager of the Popo mines, in Bolivia, is returning thither by way of Salina Cruz, Mexico.

Edgar Rickard has returned from a brief visit to the Eastern agencies of the Mining and Scientific Press.

William J. Cox, the general manager of the Camp Bird mine, Colorado, is in London on professional business.

Samuel Treloar has been appointed manager of the Bingham-Butte Consolidated mines, at Bingham, Utah.

C. O. Lindberg, formerly with Benito Juarez mines, at Piñon Blanco, San Luis Potosí, is living at Mexico City.

A. M. Yonge is superintendent of the Aguacate mines, in Costa Rica. He was formerly at the Keystone, in Amador county, California.

George Mitchell, general manager for the Clara Consolidated mining company, has just returned from the mines at Swansea, in Yuma county, Arizona.

L. W. Trumbull is at Prescott, Arizona. Upon the completion of his examination of a property at that place he intends to go to Van Vleck, Texas, for a few weeks vacation.

Latest Market Reports.

LOCAL METAL PRICES—December 17.

Antimony	12@16c	Quicksilver (flask)	$45@46
Casting Copper (scrap)	8½@13½c	Spelter	6¼@7c
Pig Lead	4.50@5.50c	Tin	32@33½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Dec. 10. £. s. d.	Dec. 17. £. s. d.
Camp Bird	0 16 6	0 16 3
El Oro	1 6 10½	1 7 0
Esperanza	3 1 3	3 1 3
Dolores	1 10 0	1 10 0
Oroville Dredging	0 8 0	0 8 0
Stratton's Independence	0 2 6	0 3 3
Tomboy	1 0 7½	1 0 7½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Dec. 11	14.06	4.23	5 14	48⅝
" 12	14.06	4 23	5.14	48¾
" 13	Sunday.	No market.		
" 14	14.06	4.23	5.14	48¾
" 15	14.06	4.21	5.14	48¾
" 16	14.06	4.21	5.14	48⅝
" 17	14.06	4.21	5.14	48⅝

MINING STOCK QUOTATIONS—NEW YORK.

	Closing prices. Dec. 10.	Dec. 17.
Amalgamated Copper	84½	78⅞
American Smelting & Refining Co	92⅜	81⅛
Boston Copper	16¼	15⅞
Butte Coalition	27⅛	26¼
Cumberland Ely	8	7¾
Dolores	7½	7½
El Rayo	3⅞	4
Giroux	6½	5¾
Greene-Cananea	11	10¾
Indiana Sonora	4½	4½
La Rose	6¼	6⅜
Miami Copper	12½	12½
Nevada Consolidated	20½	19
Newhouse	6⅛	
Nipissing	10½	10⅛
Ohio Copper	5½	5⅜
Tennessee Copper	45	45⅜
Utah Copper	48	45
Yukon	4¾	4⅝

(By courtesy of Trippe & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, December 17.

Atlanta	$ 1	Laguna	$ 1.25
Belmont	88	MacNamara	33
Booth	27	Manhattan Con	5
Columbia Mtn	17	Midway	19
Combination Fraction	1.35	Montana Tonopah	75
Daisy	75	Nevada Hills	1 30
Fairview Eagle	30	Rawhide Queen	50
Florence	4.50	Sandstorm	20
Gold Bar (Bullfrog)	2	Silver Pick	11
Goldfield Con	7.95	St. Ives	16
Gold Kewenas	26	Tonopah Extension	50
Great Bend	26	Tonopah of Nevada	6.75
Jim Butler	17	Tramp Con	10
Jumbo Extension	20	West End	31

(By courtesy of W. C. Ralston, 353 Push St.)

COPPER SHARES—BOSTON.

	Closing prices. December 17.		Closing prices. December 17.
Adventure	8½	Mohawk	68
Ahmeek	122	Nevada Con	18⅞
Allouez	37½	North Butte	81¾
Amalgamated	78	Old Dominion	55¾
Arcadian	3¼	Osceola	128
Atlantic	16½	Parrot	27¾
Boston Con	——	Quincy	93
Butte Coalition	26¼	Rhode Island	5¼
Calumet & Arizona	116	Santa Fe	2⅜
Calumet & Hecla	665	Shannon	16¾
Centennial	33½	Superior & Pittsburg	17½
Copper Range	78½	Tamarack	80
Daly-West	3¾	Trinity	16½
Franklin	16	United Copper Con	——
Granby	103	Utah Copper	44½
Greene-Cananea, ctf	10⅞	Victoria	1¾
Isle Royale	22½	Winona	6
Mass	6	Wolverine	——

General Mining News.

ALASKA.

At the Alaska-Treadwell mine developments have been pushed on the 1450-ft. level, which is to be used as a base, for deeper explorations, and to this level the Seven Hundred Foot and Mexican shafts will be extended. At the Ready Bullion mine explorations are being made on the 1500-ft. level. The stamp-mills have been in continuous operation throughout the year, and the gold production will be about the same as that for 1907. The use of oil as a substitute for coal for all purposes at these mines has reduced the fuel expense considerably, and additional water power has been provided by the building of dams on Ready Bullion and Fish creeks. Work on a project to obtain power from Turner lake, on the east side of Taku inlet, 18 miles from Treadwell, is being advanced. This project will necessitate the transmission of power across Taku inlet, a distance of 2½ miles. At the Perseverence mine developments have been in progress throughout the year, and the lode deposit is now opened at the adit level for 1500 ft. in length and 60 to 100 ft. in width. The 100-stamp mill on the property was in operation from June until November. Mining operations were in progress at the Alaska-Juneau mine from the last of June until the middle of October, and the 30-stamp mill was in continuous operation during that period. At the Eagle River mine developments were advanced throughout the year, and the quartz veins which are displaced by faults, causing much difficulty in their exploration, have been found farther in the mountain on the various adit levels. The 20-stamp mill on the property was supplied with ore obtained principally from the upper adit levels and has been operated throughout the year. Encouraging results are reported from the Yankee Basin prospects and from other properties within the Juneau gold belt, and also from the De Groff and Mills properties to the north of Sitka.——A find of rich placer ground is reported to have been made on Tuliksak river, a tributary of the Kuskokwin. The miners are said to be 'rocking' out $60 per day. Peter McGrath, formerly U. S. Commissioner, is authority for the statement that there is a proposed scheme to build dredges on Gaines creek, which is evidently a tributary of the Tuliksak river.

ARIZONA.

GILA COUNTY.

The west drift at the 450-ft. level of the Black Hawk mine of the Arizona Commercial Co. has greatly improved. Three feet of ore are now showing, averaging 12% copper and 6 to 10 oz. silver per ton. It is now evident that a large and rich ore-shoot will be developed near the east end of Black Hawk below the water-level. The Eureka shaft is producing more water, and it is believed that the pumps will now drain the Black Hawk vein. The shaft has passed through the rich glance ore.

GRAHAM COUNTY.

The shaft of the American Eagle, in the Copper Creek district, 15 miles northeast of Mammoth, in Pinal county, has reached a depth of 200 ft. A double-drum electric hoist has been installed.——The Copper Creek Mining Co. has recently built a new store and office building at its property in the same district. The machinery for the concentrating mill has been shipped, a portion of it being on the ground and the remainder, which is now at Winkleman, will be brought to the camp and installed before the close of the present year. The road which has been recently opened at a cost of about $20,000 is now completed from Mammoth to the old camp and the Copper Creek settlement. Previously the trips were made by the way of Willcox to the camp, a distance of about 150 miles, or by horseback from Mammoth. The Company expects to be producing and shipping concentrate in the early part of the year, the output of which will be taken out by way of Winkleman, over the P. & E. railroad. This will reduce the wagon haul to about 30 miles. Frank J. Sibley is general manager.——The Rosalie Copper is planning to push development on a larger scale at its property in the Copper Creek district. One of the series of veins has been tapped by the adit which is now in 750 ft. The ore is better than it was expected to be, average samples giving returns of 17% copper. Small streaks sample as high as 35% copper. Arrangements will be made at once to push the adit ahead an additional 1000 ft. to tap other veins. The largest outcrop is on the apex of the mountain.

MOHAVE COUNTY.

A. L. McKesson has leased part of his Holy Moses mining claim to Alger Bros. The lessees will go to work on the mine at once and will have their ores milled at the mine. ——The San Diego company which recently took over the Cruz mine, near Yucca, have sent in supplies and expect to start work soon on sinking a 100-ft. shaft. Joe Kelsey and M. J. Ryan are looking out for the interests of the new owners.——T. J. Grant, who is in charge of the work for the Stewart-Warner Co., at Music Mtn., expects to have the hoist in working shape within ten days. Sinking will be started at once. Carl Holtschue, of Goldfield, Nevada, is making an examination of the mine for the Company.—— A force of men has been put to work on the Climax group of mines, in Union Basin. The mines are owned by a number of oil operators in the Kansas and Indian Territory fields.

PIMA COUNTY.

The Fresnal mines, in the Barboquivari mountains, 75 miles from Tucson, have been sold to J. R. Clair and associates, of Orange, New Jersey, for $200,000. The property was located 10 years ago, but has been worked only recently. There is said to be a vein 75 ft. wide opened to the 270-ft. level, all of which it will pay to work. E. T. Jones is in charge of the development work now under way.

SANTA CRUZ COUNTY.

The capacity of the mill on the Gringo property in the Patagonia district has recently been doubled, making it a 40-stamp plant. Development work to the extent of 3000 ft. has been done in the past year.——The Arizona Gold Mines Co., owning a group of promising claims in the Fort Bowie district, has a shaft down over 100 ft., and also an adit, now in 100 ft. The ore is free milling and a mill-test of 31 tons gave returns of over $20 per ton. Should the present orebody continue with the sinking of the shaft the Company intends to erect a stamp-mill, but should the character of the ore change and require smelting, a smelter will be built.

CALIFORNIA.

ELDORADO COUNTY.

The Eureka Slate Co. has leased, with privilege of purchase, from Harron, Rickard & McCone, of San Francisco, one No. 3 Ingersoll-Rand undercutting track channeler with full equipment, including double gang for channeling steels and full set of drill steels. This machinery will be installed at the quarry at Slatington immediately and will add greatly to the equipment of that property.

PLACER COUNTY.

All the machinery has been installed at the Peckham Hill mine. The wood for the winter has been cut and hauled. Ten men are at work timbering up a slip in the tunnel.——Operations have been suspended at the dredge at Cash Rock. The number of large boulders has been a great handicap.

SHASTA COUNTY.

A rich strike has been reported from the El Dorado claim near the Tower house. Sherk Bros., of Redding, who are leasing the claims from E. P. Conner & Son, intend erecting a mill on the property as soon as practicable. The ore is said to run high, one sample assaying over $6000 per ton.

SIERRA COUNTY.

Tom Fitzgerald is doing the annual assessment work on the Golden Hope gravel mine, between the Bald Mountain Extension and Mammoth Springs. This claim is owned by

Mr. Fitzgerald, Manual Cadman, and Elmer Mott, of Forest. ——Walter M. Painter is engaged at the Gray Eagle mine superintending the erection of the new aerial tramway from the mine to the mill. The material for the tramway is nearly all on the ground and it will be in running order in two weeks.——Edward A. Work, of Nevada City, has obtained an option to purchase the Red Jacket and Good Hope quartz claims, on the north slope of Oregon creek, owned by Thomas Rose, of Pike City.

TUOLUMNE COUNTY.

The work of installing the new mill at the Mt. Hood, near the Rawhide, is under way.——Operations have begun at the Gold Crater in Knights Creek district.——Dan Lambert and associates have started work on the Reyland ranch mine at Kincaid Flat.——A Huntington mill has been put in at the Tonkins mine near Columbia.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—An 18-in. streak of rich ore has been exposed in the stope being carried in the west drift on the Aetna vein, operated by the Capital M. & T. Co. The orebody has been proved for a length of 100 ft., and from recent shipments returns of 7 oz. gold and 8 oz. silver have been received. The heading of the Capital adit is now nearing the extension of the Sporting Times vein, and it is believed the foot-wall will be reached any day. The mill is treating on an average of 70 tons per day and shipments are being made three times per week. W. M. Cooper is manager.——One of the richest strikes of the year has been made on the Colorado Central. In running a drift from the 50-ft. level of the winze sunk from the Ocean Wave level, an 8-in. streak of silver ore has been cut that is heavily sprinkled with gray copper and ruby silver, and assays from 700 to 1800 oz. silver per ton. Adams & McClusky, operating under lease, are planning to install an electric hoist. Sinking has been resumed.—— The Waldorf Metals Co., operating a large block of ground under lease, at the Wilcox adit, has cut the Paymaster vein at a distance of 5000 ft. from the portal of the adit; a 16-in. streak of smelting ore is exposed that is worth $70 per ton in gold and copper. There is also from one to three feet of milling ore that is worth $22 per ton in gold, silver, and copper. The discovery came entirely as a surprise. Previous to the suspension of work in the adit two years ago, the operator, who was working under contract, made a slight bend with the result that the Paymaster vein was missed. D. W. Sprousse, manager for the Waldorf Metals Co., in doing prospect work discovered a number of feeders, and in running a cross-cut 10 ft. the vein was reached. Since then the drift has been extended 120 ft., with the ore-shoot still in evidence.——The Western Metals Co., incorporated last week, is being backed by two well known operators of the Clear Creek district; W. D. Hoover, the principal owner of the East Griffith mine in Georgetown, and A. G. Brownlee, of Idaho Springs, principal owner of the Stanley mine at that place. It is proposed to construct plants in this county for the treatment of complex ores by a secret chemical process. The plant in Georgetown will be equipped to also treat ores containing lead and zinc, and will probably be run upon the output from the East Griffith. At Idaho Springs other grades of ore will receive treatment. If the process proves the success claimed, a new era will dawn for this district, as it is claimed the cost of concentration and smelting will be eliminated.—— Ward Bros. have taken a lease on a block of ground on the Pay Rock, one of the former heavy producers of the district. Driving is in progress and a few days ago a three-inch streak of 140-oz. silver ore was cut. Operations are being carried on through the Ashby adit, one of the first deep mining enterprises of upper Clear creek. The operators have a 'running' contract in the drift and as soon as they are satisfied with the showing they are privileged to pick any 100 ft. of territory desired.——Heavy shipments are coming in to the local sampler, due to the fact that the Christmas holidays are near at hand. Almost every lessee in the district has made it a point to send down a mill run, and as a result the sampler is running night and day.——William Kramer, owner of the Lost Treasure, Columbian Mtn., made a small shipment this week and received 320 oz. silver per ton. An adit has been driven for 225 ft., a streak of ore being followed that is from three to five inches wide.——M. Jacoby has completed the assessment work upon the Old Hickory property on Columbia Mtn. A company is to be organized and an active campaign of development is promised for the coming year.——A rich strike was made a few days ago in the Raymond adit workings, on Griffith Mtn. In extending the drift on the Baltic vein, recently cut, a streak of solid smelting ore has been uncovered that is from three to eight inches wide. Assays show 1 oz. gold, 22 oz. silver, and 7% copper. The drift is now 60 ft. long and the shoot is showing the full length. In the bottom of the level near the breast there is exposed 21 in. of ore that carries the same content as previously mentioned. Within 75 ft. the heading will cut directly under the old shaft workings, where ore of an unusually high grade was mined a number of years ago. The Baltic vein was cut 875 ft. from the entrance of the adit and at a vertical depth of 600 ft. Joseph Raymond is manager.——Fred P. Dewey has bonded and leased to J. E. Rinehart and J. M. Watt the Emma, Lucky, Lucky Extension, and Silver Quartz lode claims, on Democrat Mtn. The bond calls for $7500 and runs until December 10, 1910. The property has not been operated for about 15 years. It is understood that work will be started at an early date. ——The Alice Development Co., operating the Alice mine in the district bearing that name, will start work in the early spring upon the construction of a modern 300-ton mill to cost $250,000. A. H. Roller, of Idaho Springs, manager of the property, returned from an Eastern trip last week and stated that funds had been raised for the lifting of the bond on the property, as well as for the building of the mill. The Alice vein is 300 ft. wide in places, and while a low-grade proposition, the product can be handled at a profit, as has been demonstrated from numerous tests. The average content of the ore is from $5 to $6 per ton in gold, and a net saving of $3.85 has been reported.——J. W. Boyd, of Idaho Springs, has taken a lease upon the Dover mill, on lower Fall river. A switch is now being put in to connect with the Colorado & Southern tracks, on the completion of which the ore from the Sun and Moon will be transported by rail direct to the concentrator. The Dover mill has a capacity of 50 tons per day and is thoroughly modern.

Georgetown, December 12.

GILPIN COUNTY.

The Forks mine on Quartz hill is being worked under a lease and bond by Harry Armfield & Co., of Nevadaville. They have done some preliminary work in the shape of cleaning out levels and are now working at a depth of 250 ft. The lessees are well pleased with their outlook and intend to install a steam plant as soon as the weather will permit, and will also erect a shaft building.——A new shaft building is being erected on the Ridge mine in Willis gulch by the Protective M. Co. The Company for the time being will use the whim for hoisting operations, but intends in the near future to install a steam hoist. In the meantime they are keeping up developments at a depth of 150 ft. and the showing is reported to be an improved one. Louis Searls, of Denver, is in charge of the operation and Denver and Eastern capital is interested in the operation of the property under a lease and bond from Hal Sayre, of Denver.——Sinking operations were recently commenced by the Argo Leasing Co., operating under a lease and bond from J. C. Meagher, of Denver. Central City people are interested in the operation of the property with Harry C. Willis as superitendent, and they are in good shape to carry on extensive developments, and from the present showing will soon be numbered among the regular shippers. The shaft was down 220 ft. when they commenced sinking and the pool will sink the shaft at least 50 and possibly 100 ft. deeper this winter.——The Hughes mine on Bellevue Mtn.,

owned by Mrs. Hugh Hughes and Ed Jones, of Russell Gulch, and E. W. Williams, of Denver, is being worked under a lease and bond by R. I. Hughes, of Russell Gulch, and B. F. Threewit, of Denver. In addition to re-timbering the shaft and cleaning out the levels the lessees have installed a first-class plant of machinery and erected a shaft building. Developments are under way at a depth of 100 ft. on both sides of the shaft and a winze has also been sunk on the west side to explore the orebody. Connections will be made from a cross-cut to be driven later from the 200-ft. workings, which will furnish improved ventilation as well as still further prove up the orebody.

LAKE COUNTY.

John Cortellini and associates have taken a lease on the Tenderfoot property in South Evans gulch, and will start soon to sink a shaft to strike the rich orebody that was recently found to extend into that claim. It is believed that the ore can be reached by sinking 150 ft., and the lessees expect that they can make that distance by the first of the year.——The force of men on the Moyer is being increased gradually. Some ore is being hoisted, and it is probable that the mine will start shipping in a short time. The work of cleaning up and repairing is now almost complete. Several of the drifts are being made ready for active work. About 25 men are employed, and according to the announced policy of the management this force will be gradually increased under favorable conditions, until the full complement of men is again at work.——A cross-cut adit is being driven on the Columbine property in Lost canyon, near Granite. This work is expected to tap a high-grade vein from which gold ore has been taken through the old shaft.

SAN JUAN COUNTY.

The Detroit & Colorado Co. has let a contract to John E. Wood to continue the driving of the raise from the Thunder adit to connect with level above. The total distance is 340 ft., of which 70 ft. has been completed.——The property of the Arpad M. & M. Co. was sold by the master in chancery to satisfy a judgment in favor of the Contention Mining Co. for nearly $19,000. The later Company bid in the property, but it is not known whether the Arpad company will redeem it or not.——The total shipments from the Silverton mines for the month of November amounted to 3550 tons of concentrate and 1825 tons of crude ore, which indicates that about 20,000 tons of ore were mined.

TELLER COUNTY.

George Cockran and associates, who have a lease on the Lucky Gus mine on Bull hill, are installing a steam hoist and boiler. The shaft-house is being repaired.——The Mollie M. & L. Co., a new leasing corporation recently organized by Cripple Creek men to operate the Six Points mine on Bull hill, owned by the Stratton estate, adjoining the Lucky Gus and Blue Bird mines, has opened up a large body of milling grade ore and has commenced shipping.——A rich strike of smelting ore has been made in the upper workings of the old Burns shaft in the town of Altman by Porter Hedge, the well known lease operator of Cripple Creek.——At a meeting of the directors of the Recua Savage Gold Mining Co. held at the offices of that mining corporation at Colorado Springs recently, the first dividend to be paid its shareholders was declared. The distribution will be at the rate of one-half cent per share. The amount to be paid out is $4035. The properties of this Company are on the eastern slope of Beacon hill and are operated under lease by the Evelyn Leasing Co.——The Collinois Leasing Co. has resumed operations on the Jeff Davis claim of the Lexington Gold Mining Co., and the cross-cut started at the 220-ft. level is to be carried east until the Jones vein is reached. The Company is composed of Cripple Creek men and is backed by Chicago capitalists.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The main features of the mining industry of the Coeur d'Alene throughout the past week have been the return of the business and mining delegations sent to Washington, the consequent announcement to the effect that it is not believed that there will be any reduction of the tariff on lead ores and that zinc will be suitably protected, and, finally, a dividend of $60,000 declared by the Snowstorm Mining Co. All these features have had a most beneficial effect on the district. With continued protection of lead and a tariff on zinc it is believed that next spring and summer will be the most prosperous in the history of the county.——The Bunker Hill & Sullivan Mining co. has declared its regular dividend of $75,000 for the month.——A force of 25 men is employed at the property of the Butte & Coeur d'Alene Mining Co. in the construction of capacious boarding and bunkhouses and a timber-shed and as soon as this work is completed the installation of the new hoist and compressor will be started, preparatory to sinking on the orebody to a depth of about 400 ft. The new wagon-road to the mine has been completed, and, owing to the want of storage facilities, shipments from the property will commence at once. The ore will go to the smelter at Sand Point.——The Government Gulch M. & D. Co., on the gulch of that name, is making preparations for the installation of a hoist capable of sinking to a depth of 250 ft., and Guy Martin, one of the principal owners, will go to Spokane to place the order. The property has been developed in part through the workings of the Last Chance mine at Wardner and some good ore exposed.——At the annual meeting of the stockholders of the Pandora Copper Mining Co., J. C. Weatherhead and Walter H. Hanson were re-elected president and secretary respectively. The secretary's report showed that since the incorporation of the Company $7216 had been placed in the treasury and about $6312 expended on the property, leaving a balance in the bank of $903.39. The main adit has been driven about 600 ft. at a cost of $11 per foot and the management believes that the condition of the mine is most encouraging.——The new compressor at the property of the Aeolian Mining Co. is being installed. For the rest of the winter three drills will be used at the mine and development confined largely to the upper workings. Next spring the force at the mine will be increased and the men set to driving on a 1500-ft. adit to give a depth of 350 ft. below the present workings.——The local management of the Stewart mine at Wardner has received orders to proceed with the annual assessment work, and because of that fact it is now believed that the regular development of the property will not be taken up this year or in the near future. The property is under the control of F. Augustus Heinze.——An assessment of five mills per share has been levied on the stock of the Hypotheek Mining Co. and the notice is accompanied by a report of progress, submitted by Octave Guay, the manager. It deals with the showing made in all the levels of the mine, and is regarded as most encouraging. The shaft is 650 ft. deep and is going down at the rate of two feet per day. Altogether about $60,000 has been expended in development and the mine is thoroughly equipped with machinery of all sorts.——At the annual meeting of the stockholders of the Atlatnic Mining Co. a complete reorganization of the Company was made. The new officers and directors are: President, Walter J. Bracking; vice-president, F. M. Rothrock, of Spokane; secretary-treasurer, Otto A. Olsson. Charles Samuels and A. H. Featherstone are directors. It was decided to purchase some more mining ground and to proceed with the development.——The foreclosure sale of the property of the Charles Dickens Mining Co. was held at the mine at the end of the week and the mine, mill, and all the rest of the equipment bought in by A. D. Gritman, the mortgagee, for $55,143, the amount of the mortgage. Mr. Gritman has also a money judgment for $29,000, but on this there were no bidders, and as a result the judgment still stands. Mr. Gritman will assign the property to the Idaho-Knickerbocker Mines Co., organized for that purpose. The mine was regarded by many as one of the most promising in the district and has already shipped a considerable amount of ore.

Wallace, December 12.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence.)—The Kramer Thomas Reppy Co., at Lehigh, has built a six-foot concrete wall around the mouth of the shaft in order to prevent damage from the overflow of Spring river during the rainy season. A great loss of time and money is thus hoped to be prevented, as a great deal of trouble has been experienced from that source in the past.——Abernickle & Co., operating northwest of Galena, is sinking the shaft deeper to take up a rich stope beneath the drifts. Later the mine will be deepened to catch a lower run of ore. The Company has been a good producer and has a 150-ton mill which has been active up to the present development work.——Ernest Noble & Co., operating on the Clairmont land, south of Galena, has completed a drilling campaign in which 9 out of 17 drill-holes entered ore. Ore is now found in the first shaft at 37 ft., though the full face has not yet been uncovered. As soon as the shaft penetrates the run a drift will be started.——In the heart of Galena a rich strike has been made upon the old Pickett & Kincade lease which was worked years ago. The new company has taken up the development and recently penetrated the ore in uncut ground at 107 ft. A 20 by 30 ft. face has been opened. The ore assays 20% zinc-blende.——Good ore was accidentally discovered on the Puckett farm southwest of Galena. The peculiar formation of the rocks along Brush creek was noticed and found to contain streaks of high-grade ore. Prospect work will be started immediately. The land lies between the Galena and Baxter Springs camps.——The Success Mining Co. has taken over the Mason property in the Baxter Springs camp and will reopen it at once. A centrifugal pump has been installed and the milling plant has been completely overhauled. The mill has a capacity of 200 tons. The underground workings have been fully developed, a number of drifts having been run out at 230 ft. A 32-ft. face of ore has been opened up.——The Eastern L. & Z. Co. has begun the development of a lease adjoining the Sweeney property. Shafts are being sunk on drill-holes which showed ore. Both galena and zinc-blende were found, some of the ore assaying as high as 18%. The Company plans to thoroughly develop the lease by shafts and drifts and then erect a 250-ton mill.——The highest grade ore yet found in the north camp at Baxter Springs is being taken from the shafts of the Good Luck Co. The ore assays 58% metallic zinc. In the west shaft a 23-ft. face of galena is also being worked.——The Wichita L. & Z. Co. is driving in several directions from the shaft and is finding rich ore which is being piled on the dump. A mill will be erected during the coming winter.

Galena, December 11.

NEVADA.

ESMERALDA COUNTY.

Reports from Goldfield state that the Combination Fraction Co. will lease the Combination mill when the new plant of the Consolidated is completed. The Combination Fraction Co. is, on its own account, shipping only about 30 tons per day and the Little Florence lease is shipping small amounts of ore, pending the time when the ore can be reduced nearby. On the ground of the latter the winze that is being sunk from the 300-ft. level is down 30 ft. and has entered a fine body of ore that assays $40 and $48 per ton. An air-hoist is being installed at the 300-ft. and the winze will be sunk to the 370-ft. level. The three-compartment shaft has reached a depth of 600 ft., and seems to be cutting into the hanging wall of a vein that may prove to be the Combination or Mohawk.——The Great Western Co., at Hornsilver, is making shipments of about 12 cars per month, which is hauled overland to Cuprite and sent from there to the Belmont mill at Millers.——Ambler & Stingley made the initial shipment from their Grand View No. 1 claim, at Hornsilver. It consisted of 75 sacks of high-grade gold-silver ore, estimated to be worth $150 per ton.——Fire destroyed the entire business district of Mina during the night of December 15. The conflagration started in the Davis hotel.

LINCOLN COUNTY.

The Metals Exploration Co., a Salt Lake concern, has started work on its recently acquired Point property, at Pioche. Frank B. Cook, the general manager, was on the ground last week and purchased lumber for a number of buildings. He announced that his company would purchase a gasoline engine and proceed with development at once. Thomas J. Hooper has been made superintendent at Pioche.——A group of Salt Lake men, headed by John A. Kirby, has recently purchased the Ben Hampton and the Belcher groups, at Pioche.——R. K. Cobb & Co., of Salt Lake, last week purchased the Jim Crow group of six claims, adjoining the Point group on the south, and lying between it and the Demijohn. The sale was made through J. S. Free.——The Searchlight Copper-Gold Mining Co. has let a contract for 50 ft. of driving in the adit on its group at Camp Dupont, 12 miles east of Searchlight. Mrs. V. A. Brewer, of Los Angeles, is secretary of the Company.

LYON COUNTY.

The No. 4 adit at the Mason Valley Copper mine last week reached the winze sunk from the No. 3 level. This lower level gives an additional depth of 140 ft. on the ore-body. Forty men are employed. The Mason Valley is four miles west of Yerington.——The Western Nevada, eight miles southeast of Yerington, has completed its shaft to the 300-ft. level and is now driving three cross-cuts to the vein. Machine-drills are in use. Twenty men are working. R. H. Britt is manager.

Tube-mill in the New Plant of the Goldfield Consolidated Mines Co.

NYE COUNTY.

The November output of the Bullfrog district amounted to about $137,000, the principal contributors being the Montgomery-Shoshone, with $70,000, the Keane Wonder, the Homestake, and the Pioneer.——The Montana-Tonopah Co. has temporarily suspended sinking operations in its Mizpah shaft at a depth of 1274 ft. Water, in such quantities as to require pumps, is given as the cause. The report from the mill for the past week shows that an average of 99 out of 100 stamps has been dropping continuously, crushing 3210 tons of ore, carrying $23.50 per ton. The bullion shipment consisted of 72 bars, weighing 77 lb. each, and valued at $815 per bar, together with 50,000 pounds of concentrate, worth $11,500, making a total bullion production for the week of $70,180. An average extraction of 88% is recorded.——The Mayflower Bullfrog Con. M. Co. has recently elected A. C. Eisen president, and re-engaged A. Sydney Additon as superintendent and manager. A five-stamp mill has been purchased and the grading is now in progress at the property of the Company at Rhyolite.——The total output of the Tonopah mines for the week ending

December 12 was 5268 tons, of an estimated value of $131,700.

STOREY COUNTY.

(Special Correspondence).—The Ward shaft has been pumped dry for the first time in 15 years. It is believed that the electric pumps will have no difficulty in handling the water.——The Ophir shaft is being repaired below the 1200-ft. level and driving is going on at the 2300-ft. level. Ore is being taken from the 2100 and 2200-ft. levels.——At the Con. Virginia the work is going on at the 2150, 2250, 2350, and 2450-ft. levels. A small tonnage of ore is being mined.——At the Yellow Jacket the work of driving the incline below the 1100-ft. level is progressing satisfactorily. The 1200-ft. station is being re-timbered.——The Confidence-Challenge-Imperial cross-cut on the 70-ft. level is being pushed ahead vigorously. A south drift has been started 11 ft. from the face of the cross-cut to intersect the vein. It is reported that good ore has been found on the 300-ft. level at the Confidence.

Virginia City, December 12.

OKLAHOMA.

OTTAWA COUNTY.

(Special Correspondence).—Hill & Stevens, of Joplin, are sinking two shafts in the Miami field which are down 113 and 114 ft. One will go beyond the 120-ft. level, owing to a peculiar dip in the ore at that point. Ordinarily the ore is found at 105 ft. in the Miami camp. The two shafts will be connected and a mill erected.——The Indianola Mining Co. has taken a five-acre lease on the Miami Royalty Co.'s land and will develop it in addition to its present holdings. The Company is operating the Old Chief property, which has a 150-ton mill.——A new mill will soon be ready for operation at the Golden Hen lease, making the ninth in the Miami camp. This property adjoins the Miami-Yankee and Queen City leases. The mill is not a new one, but is being moved from Joplin and will be completed within two weeks. Before erecting it the Company put down a shaft and did a large amount of driving.——Ore in paying quantities has been found on the George Larkins farm northwest of Miami. It was found from 26 to 103 ft. The strike has stimulated interest in the vicinity and neighbors have begun prospecting. Ore has also been found on the Ludlow farm, north and west of Baxter Springs. The strike was made in virgin territory. The ore is good and is thought to be an extension of the Miami field. Prospecting will be continued by drilling.——At Afton, ore has been found on the Dawson farm at from 8 to 10 ft. and the formation is favorable for a rich run of zinc-blende and galena. The whole farm has been proved to be underlaid with a mixture of flint and zinc. Several shallow shafts have been sunk and these will now be deepened and more drilling done.——Owing to the greater demand for spelter than at any time since the financial depression the furnaces of the smelters at Bartlesville have been started again. Additional blocks have been fired at the Bartlesville, the Lanyon-Starr, and National smelters. Another block of the Lanyon Zinc Co.'s smelter at Iola, Kansas, was also started and the United Zinc & Chemical Co. now has its plant operating at full capacity for the first time in over a year.

Miami, December 11.

WASHINGTON.

OKANOGAN COUNTY.

(Special Correspondence).—Work has been resumed in the Palmer Mountain adit. A station is being cut out near the breast, where a compressor is to be installed. The adit is now in about 4600 ft. In addition to gold-bearing quartz veins, there are iron sulphide veins ahead, which have been partly developed by surface workings.——The Triune mine, producing free-milling gold-bearing quartz, situated in Golden camp, on Palmer Mtn., which has been worked spasmodically for several years, has now fallen into the hands of a Boston syndicate, and the indications are that it will be henceforth steadily operated. The new management has closed a contract with the Similkameen Falls Power & Light Co. for electric power, and a transmission line will be constructed and the mine will be equipped with electrical machinery. A new adit, for prospecting the mine at additional depth is now in several hundred feet.——Work is being crowded at the Rich Bar mine, on the Similkameen river, and a new vein has been found while cross-cutting on the 150-ft. level. This mine was discovered while grading for the Victoria, Vancouver & Eastern railway, and a fine exposure of rich silver-lead ore resulted at that time. The new discovery is equally as good.——Work has been resumed in the upper adit of the Bluffton mine, now in 343 ft.——The new shaft on the Ben Harrison mine is down 213 ft. Three shifts are employed.——The Olentaugy mine is being re-timbered and put in shape for a renewal of active development.——The Poland China mill is being re-modeled, the leading feature being the replacing of the crushing rolls by stamps.——The Grant Consolidated Mining Co. is constructing six miles of wagon road between the Grant mine and the Vancouver, Victoria & Eastern railway, with the intention of resuming the shipment of ore to the smelters.——The Allen Gold Placer Co., of Ohio, owning an extensive tract of placer ground and a large group of lode claims, is about to resume work on the latter.——The Q. S. Gold Mining & Smelting Co. has held its annual stockholders election. A. M. Dewey is president and general manager. The report shows about 2000 ft. of development work and 30,000 tons of ore in sight. About $8000 was spent on

Map of Washington.

the mine during the present year. Railway transportation for ore to the smelters is expected within the next ten months. Since the organization of the company, in 1897, about $85,000 has been expended on the property.——H. B. Skinner, engineer for the Okanogan Electric Railway Co., has gone to New York to meet a syndicate which is to take the bonds of the Company. The new line will handle the ore from the Q. S. and a number of other mines in and around Conconnully, Loomis, Nighthawk, and Oroville, and will undoubtedly become a great factor in building up and developing a large area of mining country in the northern part of Okanogan county.

Conconnully, December 11.

STEVENS COUNTY.

(Special Correspondence).—The shaft on the Tungsten King mine, in Deer Park district, is down 49 ft., following a 30-in. vein. The floor of the shaft is heavily dotted with lumps of wolframite, some of them weighing from one to two pounds, and there is also an eight-inch streak of solid wolframite going down from the bottom. The walls of the vein are porphyry. Considerable activity is expected to result from the discovery in the Tungsten King, and it is expected that large shipments of concentrate will be made from the district next year. Claims have been staked continuously for a distance of about eight miles from the point of original discovery northward. It is reported that the ore from the Tungsten King mine will yield concentrate worth $40 per ton.

Deer Park, December 10.

Special Correspondence.

LONDON.

Tin Mining in Malay States.—The Kinta Mines.—Old Cornish Mines.—The Famatina Company and its Troubles.

In spite of the depression in the price of tin, some of the tin mining companies in the East are doing sufficiently well. The Kinta Tin Mines, Ltd., is a case in point. This is a London company with no Cornish interests, and it has worked mines at Ipoh, in Perak, Straits Settlements, for eight years, and has repaid approximately all its capital, £60,000, in dividends. In spite of the drop in the price of tin, the result for the year ended June 30 is satisfactory, for an available profit of £10,696 was made, which, with £8157 carried forward from the previous year, made £18,853 available for distribution. Out of this only £3000 has been distributed as dividends, and £9180 has been written off, representing the cost of new property recently acquired and the cost of the new pipe-line. In addition, a loan from the bank of £7000 has also been repaid. This loan was raised for the purpose of financing the purchase of the new property, which hitherto had been worked by local owners with water and plant supplied by the Kinta company. The amalgamation of the two properties has been exceedingly advantageous, for an important additional production has been secured at a small extra working cost. The output for the year was 289 tons of concentrate, which sold at £23,734, or £82 per ton. Of this amount 155 tons came from the old mine, and 134 from the ground recently acquired. While writing of tin mines it is interesting to note that the fall in the price of the metal has had no effect in curtailing production in any part of the world. Tin mining is extremely active everywhere. Is this because there is no convention among producers? Or is it because there is no production in the United States, and consequently no Trust?

Several of the tin properties in the St. Austell district of Cornwall are being actively opened up. Two syndicates are working on the Tregrehan estate. One of them is controlled by Greek merchants resident in London, and the operations are directed by J. H. Collins. The other is the New Wheal Eliza Consols, Ltd., of which Carlton Roberts is chairman, and R. H. Williams, engineer. The Wheal Eliza is a well known property, and many have been the rumors relating to its purchase and exploitation by different parties from time to time. The work now being done consists of a thorough underground investigation of the old workings, together with new exploration work at different parts. It has been found that there is a good deal of ore in the upper parts that one would expect the old owners to have extracted, for it runs rich enough to have paid by the crudest methods. I believe the old workings were abandoned because the lodes were found to run right under the old manor house of Tregrehan, and were therefore likely to disturb its amenities. Mr. Williams' investigations have also shown that no work has hitherto been done below the water-level in the adit, so that large reserves of ore should be found directly pumping is begun. This company has gone about its development carefully and has refrained from buying machinery until the discoveries warranted. It is now proposed to invest in a 50-hp. electric plant for hauling and pumping, and to erect a prospector's stamp-mill. This seems the right way to re-open an old Cornish property.

The Famatina Development Co. has been in a precarious state, but I am pleased to be able to report now that its finances have been placed on a sounder footing and the business of the mine and smelter re-organized in a satisfactory way. This company owns the Famatina copper mine in the province of Rioja, in the Argentine. The mines are situated at an elevation of 14,000 ft., like so many other valuable properties in the Andes. The ore is transported by an aerial ropeway to the smelter, which is about 4000 ft. lower. The ore is friable and difficult to concentrate; also a great deal of fine is lost in transit and in the blast-furnace. It is necessary to smelt the ore without concentration, and attempts have been made to introduce pyritic smelting. The reserves of ore amount to 200,000 tons, varying from 3 to 12% copper, from 2 to 14 oz. silver, and about 6 dwt. gold. Five years ago, when the present company took hold of the property, the prospects seemed excellent. Arthur Thomas was engineer, and T. C. Cloud went out as metallurgist; but for all that the history of the company has not been satisfactory. Mr. Cloud was not engaged to stay permanently, and the operation of the smelting works has not been a success. In addition, the high altitude affected the health of Mr. Thomas. I ought to mention that the control of the company is in the hands of the Allen & Meyerstein group, who have done so much for the Cornish mines. When affairs at Famatina assumed a serious look, H. J. Meyerstein proceeded to the spot, and he is there now, so as to see the business placed in a satisfactory position. Gordon Wilson is taking up the management of the mine, in place of Arthur Thomas, who has been invalided home, and F. S. Nicholls, son of T. D. Nicholls of the Cape Copper Co., is to direct the smelting operations. In order to reorganize the finances, it has been found necessary to increase the share capital from £400,000 to £700,000 by the creation of 300,000 new shares. Of these, 190,000 are being issued to satisfy creditors who have lent money, and 60,000 are being offered for subscription among shareholders. The remaining shares are being held in reserve under option to the financial houses which have helped the company through its difficulties.

WASHINGTON.

Second Conservation Congress.—Southern Commercial Congress.—Exhaustion of Mineral Resources.—Committee on Mining Bureau Bill.—Commission on Revising Mining Law.—Increased Appropriation for Geological Survey.

This week Washington has been filled with delegates to the second conservation conference called by President Roosevelt. Some thirty States were represented by their chief executives and advisors. In addition, there were delegates from the national engineering societies, the American Institute of Mining Engineers, the American Mining Congress, and other organizations. Since the Southern Commercial Congress and the National Rivers and Harbors Congress were in session at the same time it was a busy week for Washington.

At the Southern Commercial Congress the principal address of interest to mining men was made by C. W. Hayes, who pointed out that there are thirty-four different minerals of economic importance produced in the South in commercial quantities, and of several of these the Southern States produce the almost total supply, including aluminum ore, sulphur, phosphate, monazite, asbestos, fuller's earth, and manganese, and more than one-third of the total production of natural gas, petroleum, fluorspar, pyrite, barytes, asphalt, mica, talc, and soapstone. While the deposits of these minerals are very large they are not inexhaustible and in many instances are mined and marketed under excessively wasteful methods. The present methods used in connection with phosphate rock and bauxite are examples of inexcusable if not criminal waste in the development of certain valuable deposits.

L. C. Glenn, of Vanderbilt University, discussed the coal resources of the South and took the ground that since the coal would shortly be all needed for industrial development in the South alone, its exportation was a short-sighted policy and should be discouraged.

At the Conservation Conference Senator Frank P. Flint, of California, presented the report of the National Conservation Commission so far as related to minerals. According to the report of the commission "The mineral production of the United States now exceeds $2,000,000,000 in value every year, and is second only to agriculture as a contribution to our national wealth. It furnishes our light, heat and power, and supplies 65% of the freight traffic of the country. The waste in the mining and treat-

ment of mineral substances during a year is equivalent to more than $300,000,000. The available and easily accessible supplies of coal in the United States aggregate approximately 1,463,800,000,000 tons. At the present increasing rate of production this supply will be so depleted as to approach exhaustion before the middle of the next century. The first step in extending the life of our fuel supply should be to lessen the waste in mining, handling and transportation of coal. But there are equally great possible savings in the use of the coal, not only in the prevention of waste now recognized as such, but also in discovering means of avoiding the losses involved in the transformation of heat into mechanical and electrical energy. The known supplies of high-grade iron ores in the United States approximate 3,840,068,000 tons. It is evident that before 1940 either the production will have reached a maximum and begun to decline, or large use must be made of low-grade ores not now classed as available, or the importation of foreign ores must be greatly increased."

No attempt has been made to estimate reserves except of coal and iron. It is believed, however, that the known deposits of gold, silver, copper, and the minor metals will be exhausted within one to three centuries. It was also pointed out that the production of the various minerals is interdependent, more iron calling for more of coal, of copper, and other metals. At present the coal consumption is not only increasing enormously, but is increasing per capita. In the judgment of statisticians this will long continue and the nation must prepare to care for at least three times the present population within a century.

In the general discussion which followed the presentation of the report, Governor Johnson of Minnesota took exception to the estimate of iron-ore reserves, and was answered by Governor Blanchard, of Louisiana. Mr. Thomas Walsh, of Colorado, read a carefully prepared paper pointing out the need of careful and sustained experimental work to render available lower grade materials, and thus maintain a basis for permanent industries.

At another session the particular need of conserving phosphate deposits and, if possible, preventing their exportation, came up for discussion, and it is not improbable that the first definite and practical result of the conservation movement will be along some such line.

Aside from the Conservation Conference there was much to interest mining men. President Richards, Secretary Callbreath, and a select committee from the Mining Congress were conferring with Senator Dick and others regarding a bill for a Mining Bureau. It is hoped this will pass the Senate, where it is now lodged, before Christmas, so as to enable provision for the work to be made in this year's estimates. A. G. Brownlee, George J. Bancroft, and a strong committee of Colorado mining men, were in conference with Gifford Pinchot regarding mining claims in Forest Reserves, and it is hoped some good may result from a frank discussion at first hand. A movement is on foot to ask Secretary Garfield to appoint a committee of mining engineers to visit the West and study the problem of revising the mining laws. It is understood that the Secretary's estimates for next year's work of the Geological Survey include an increase of $20,000 for the Alaskan work. This is the more significant since the President is said to have requested the Departments to make no estimates at this time for increases. The exception seems to be well chosen, and it is hoped Congress will allow the estimate to stand. Waldemar Lindgren is now lecturing on ore deposits at the Massachusetts Institute of Technology, and W. H. Emmons is giving a course at the University of Chicago.

SALT LAKE, UTAH.

Dividends.—Majestic Copper.—Estimates.

Several Utah mines have posted dividends during the past week. Silver King Coalition of Park City will disburse $375,000 on the 30th inst., the sum being twice the regular quarterly distribution. The Colorado Mining Co. of Tintic is to pay $80,000; Sioux Consolidated, $59,631, and Uncle Sam Consolidated, $10,000. The Silver King has issued its annual report, being the first ever sent out to shareholders by that company, and contains a detailed statement from Duncan McVichie, who spent several months in making a thorough examination of the properties, and shows that the actual and probable ore at present available in the mine is more than 99,000 tons, having a gross valuation of $5,580,780, or $3,761,648 net. In addition to the available ore, the report estimates the possible ore in the undeveloped portion of the company's domain at 974,755 tons. But in arriving at the probable value of the ore, the report cuts the tonnage in two and then assumes that the average net value of the available ore will prevail. This is given at $51.76 per ton, net, so the 487,377 tons figured show a value of $25,226,633. On December 1 the company had cash on hand $356,883, and ore in transit of the value of $80,000.

A special meeting of the shareholders of the Carisa Gold & Copper Co. of Tintic has been called to consider the advisability of increasing the capital stock from 500,000 to 600,000 shares. The smelter at Milford, which is owned by the Majestic Mines Co., has been leased by F. Augustus Heinze for a period of five years. Engineers in the employ of Mr. Heinze have been making an inspection of the plant, and it is stated that immediate steps will be taken to remodel it. The plant is to be ready for operation by the time the Ohio Copper Co.'s mill at Bingham goes into commission, which will be early in the coming spring. The King David Mining Co., of Beaver county, has completed the purchase of the Reciprocity group of 15 mining claims for $15,000.

BUTTE, MONTANA.

Smelter-Smoke Troubles.—Threats of Action by United States Government. — Finding of Master in Chancery. — Adjustment of North Butte Extension Difficulties.—British Butte Dredge.

The entire State of Montana was aroused and alarmed by the report from Washington that President Roosevelt had intimated that he would direct suit to be brought against the Amalgamated Copper Co. to close its $10,000,000 smelter at Anaconda. Commercial bodies, city councils, labor unions, and prominent citizens from nearly every city and community in the State sent petitions and protests to the President, and the representatives of Montana in Congress. The attitude of the President could not be understood, in view of the fact that a suit of the same import was then pending in the United States Court in Montana, and awaiting a decision from Judge Hunt. A syndicate of farmers which had been trying to force the Amalgamated company to settle for damages is the plaintiff in the pending suit, and it was on representation from these farmers to the effect that the timber on the Government Forest Reserve was also being killed, that the President became interested. The farmers did not make a strong case at the trial, and the Master in Chancery reported against issuing an injunction. It was apparent that the litigants feared that the Federal Court would sustain the Master's findings, and anticipating that they appealed to the President. The closing of the Washoe smelter would result in the closing of three-fourths of the mines at Butte, many of the lumber mills and camps and other industries of the Amalgamated Co., throwing out of employment no less than 20,000 men, and directly affecting fully 100,000 people in Montana, Idaho, and Wyoming. The statement is made by men familiar with the facts, that all the timber and Government land within the smoke-affected territory is not worth as much as one month's output of the mines and Washoe smelter. The timber which so greatly concerns the President consists exclusively of lodge pole pines and firs and scrubby trees, of little value. It is claimed also that it is utterly impracticable to install smoke consumers or desulphurizing apparatus at the smelter, as the product could not be disposed of or stored, because of the enormous quantity that would result. It is estimated that the big stack at the smelter emits fully 2500 tons of sulphur every day.

The Anaconda Copper Mining Co. has started sinking a shaft on the Right Bower lode-claim to explore that ground as well as the Matte and Adelaide, two adjoining claims. The Right Bower is situated north of Meaderville, on the east side of the Anaconda mine hill. The ground is known to contain some good copper-bearing veins. It is the first exclusive development work that the Anaconda company has undertaken in several years.

The Tuolumne Mining Co., which is developing a claim adjoining the Speculator mine of the North Butte Co., is planning for a big producing property. An immense new surface plant is being installed, for which an entire train-load of machinery, boilers, and so forth, has been received. The new equipment includes a large compressor, a new battery of boilers, and everything with the exception of a new hoisting engine. The latter will not be installed for several months. The engine has been ordered, and will be one of the largest in the district, capable of working to a depth of 3500 ft. The shaft is now about 1150 ft. deep, and will be carried to a depth of 1600 ft. before the work is stopped; but on reaching 1200 ft. a level will be opened at that point for development. On the 1000-ft. level a large body of commercial ore has been developed.

The new directors of the North Butte Extension Development Co. announce that a settlement has been arranged with the litigants in Butte, and that they consider the arrangement beneficial to the future of the company. They say that by the settlement the new company acquires title at once to five-eighths of the Overman claim, and eleven-sixtieths of the Free Trade, these fractions being worth in the aggregate about $125,000. The company also has options on favorable terms on the remaining three-eighths of the Overman and the balance of the Free Trade, Occidental, Michigander, and Third Sphinx, making in all a large and valuable property. Many stockholders in the old company refrained from depositing their stock for exchange on account of the suits pending. The re-organization committee, feeling that this body of stockholders was entitled to consideration, now that the litigation has been adjusted, has given them another chance to make the exchange of old stock for new on the basis of share for share and the payment of 60c. The directors of the new company are R. J. Horner, C. H. Moore, George N. Orcott, Joseph O. Morris, and A. M. Andrews.

The gold dredge of the British-Butte Mining Co. will be finished shortly after the first of the year and will be ready for operation. The company owns 1000 acres of ground west of Butte, which was mined near the surface for gold in the pioneer days of Butte.

MEXICO.

Guanajuato-Jalisco Development Co. Organized.—Water-Power Development in Jalisco.—Carrizo Smelter. —New Companies Entering Hostotipaquillo.

Word has reached Mexico that Dwight Furness, of Guanajuato, who has been in New York for some time past, has succeeded in organizing a strong company to develop and operate Mr. Furness' Guanajuato and Jalisco mines. The company is to be known as the Guanajuato-Jalisco Development Co., will have a capital of $4,000,000 gold, with James C. Hinchliffe as president and Dwight Furness as resident manager. The properties that have been put into the new company are the Agua Blanca, a large copper mine near Ayutla, and the Calabasa, on a strong lead vein near Etzatlan, both in the State of Jalisco; and the Cabrastante, San Gerónimo, Dolores, and Sevillano, near the city of Guanajuato in the State of the same name. The two Jalisco properties have been extensively developed and with little difficulty should be put on a paying basis, the Agua Blanca being already a shipper of ore, as was also the Calabasa some years ago, though both properties need large concentrating plants. Of the Guanajuato properties the Cabrastante has not been extensively developed, but is on a strong quartz vein with good pay-shoots and it certainly gives excellent promise; the San Gregorio has had more work done upon it, and has a splendid showing. With the San Gregorio are large timber tracts, and a narrow-gauge railroad from Marfil, Guanajuato, but it is not stated whether these are included. With the Dolores and Sevillano the writer is not so familiar, but their situation is excellent. Had these properties been in strong hands long ago they would without doubt have been good producers today. It is stated that the Company will immediately put up $500,000 gold as a working capital and that the principal attention will be first given to one property until it is put upon a paying basis, and then another will be taken up; or possibly a few subsidiary companies may be formed. In the plans made Mr. Furness has counted largely upon the great saving to be obtained from electric power. Guanajuato, of course, now has such power for use at the properties there; the Agua Blanca could obtain it without great expense from the Ayutla river; and the Calabasa would get it from the plants that will probably be installed at Etzatlan before the end of 1909. It has been estimated that on the Santiago river near Guadalajara, or at least between Guadalajara and Hostotipaquillo, over 200,000 hp. may be developed. At present the greater part of this is going to waste. A plant at the Juanacatlan falls is developing 11,000 hp. and furnishing Guadalajara with some of its

State of Jalisco, Mexico.

light and power. Manuel Cuesta Gallardo, one of Guadalajara's wealthiest citizens, controls a number of concessions along the Santiago amounting in all to about 50,000 hp., and he has announced that he is prepared to contract for any amount of electrical power within that limit at Hostotipaquillo or Etzatlan, to be delivered during the latter part of 1909 or early in 1910, all of which means much to that district. Power will probably be developed in Tepic and on the west coast. Several electric roads are in contemplation, some of which have been mentioned before in these letters, and now the Soledad Development Co., in which George Mitchell, of Los Angeles, is interested, has asked for a concession for an electric road to run from Guadalajara to the San Carlos Gold Mines Co., at Mezquital del Oro, in the State of Zacatecas, the English company owning the San Carlos having recently resumed operations and installed a cyanide plant after some years of idleness.

It is understood that during December the Carrizo Copper Co., of St. Louis, in charge of Kent E. Keller, will blow in its 85-ton furnace at Ayutla, Jalisco. In the San Felipe shaft of the Ayutla Mining Co., under lease to the Carrizo Copper Co., sinking has been resumed, and at the 300-ft. level the workings are in 8 ft. of fine ore, while on the level above, the vein has been opened to a width of 30 ft. and is producing 100 tons per day. The ore is sorted, that con-

taining over 12% copper going to the smelter, and the remainder to the concentrating mill. The latter at present has 40 tons capacity (and is producing 10 tons per day of concentrate). It will have 10 stamps, concentrators, tube-mill, and cyanide tanks. This property is controlled by the Makeever Bros., of New York and Boston, one of whom is at present making a trip to the mines in Jalisco with a number of the stockholders. Capital from San Antonio, Texas, is said to have been placed in Hostotipaquillo by J. A. Vick. He is credited with having taken over the San José, Deseada, and Espada in that camp for ₱150,000. Frank G. Stevens, for some time manager of El Favor for the Makeevers, has interested English capital in the Hostotipaquillo district, and organized the Mololoa Consolidated Mines Co., to take over the Mololoa and other holdings of Carlos Romero, of Etzatlan, which are among the best in the Hostotipaquillo district. In the territory of Tepic the Cambio Gold Mining Co., in the Rosamorada district, is adding a cyanide plant to its new mill.

TORONTO, CANADA.

Reaction in Cobalt Stocks.—Prosecutions of Wild-Cat Companies.—Cobalt Ore-Shipments. — Verdict in La Rose v. Right-of-Way.—First Gold Coinage in Canada.—Gowganda Lake.

The reaction in Cobalt stocks continues, notwithstanding the fact that several companies have recently declared substantial dividends, including the Crown Reserve, which paid 12%, with a bonus of 4% for the half-year, and the City of Cobalt, which distributed the usual quarterly 3% dividend, with a bonus of 7%. Occasional spurts in individual stocks, usually followed by a recession, have relieved the general downward tendency, which is apt to be characteristic of the market during the season preceding the holidays, and has doubtless been intensified by the absorption of capital in new flotations. The warning recently issued by Mr. Hanna, the Provincial Secretary, to promoters that they must henceforth comply with the rigid requirements of the law concerning details to be presented in prospectuses, has so far had little effect, but it is now announced that action is to be taken in earnest. A list of a half-dozen offenders has been published, against whom prosecutions are forthwith to be instituted, and service of proceedings has been made on a number of directors. In some cases difficulties have arisen owing to companies having no directors resident in Ontario. It often happens that all the directors live in the United States, and that the shares are issued across the border. Two of the companies which the Government is endeavoring to discipline, the Mother Lode and the Big Six, based on Montreal River properties, fall in this category. It is announced that if they can be reached in no other way, their charters will be cancelled. If the Government is really in earnest in the suppression of 'wild-catting,' no other course lies open, because to allow companies to evade the law by the simple process of appointing American residents on the directorate would be merely to transfer the headquarters of the wild-cat concerns to the border cities across the line. Thomas Mulvey, the Assistant Provincial Secretary, who has charge of the prosecutions, stated that so far he had seen only one mining company's advertisement which complied with the act. The Provincial Government is certainly making a great show of bringing offenders to justice, but it has been only after continuous prodding. In this movement the *Canadian Mining Journal* has taken an active part. It may be questioned whether anything which the Government can do, or is likely to do, can sensibly abate the evil, and whether, instead of passing dead-letter legislation, supposed to protect the innocent investor, which merely gives a false impression of security through the prestige of a government endorsement, it would not be better to renounce all pretense of supervision or regulation, and warn the public that buyers of shares must take their own measures to safeguard their interests.

Cobalt continued to make heavy shipments during November, the following being a list of the shipping mines for the month: La Rose, 645 tons; Nipissing, 422; McKinley-Darragh, 382; O'Brien, 287; Crown Reserve, 268; Temiskaming & Hudson Bay, 120; Tretheway, 95; Temiskaming, 92; Silver Queen, 76; Silver Cliff, 73; Foster, 70; Coniagas, 64; City of Cobalt, 63; Buffalo, 52; Right-of-Way, 31; Kerr Lake, 30; Chambers-Ferland, 30; Nancy Helen, 21; Townsite, 20; Cobalt Central, 20; Nova Scotia, 20. Total, 2881 tons.

The shipments for the 11 months of the year, ending with November, were 21,467 tons, as compared with 13,562 tons during the corresponding period of 1907. The Red Rock and Green Meehan mines, both of which had ceased production owing to financial difficulties, have passed into the hands of a strong syndicate, and are amalgamated as the Mount Royal M. Co. George Leyson, who was formerly superintendent of the Silver Queen, has been placed in charge. The Nova Scotia bids fair shortly to take its place among the dividend payers. The annual statement showed a total value of ore extracted for the year of $354,117, at a cost of $103,198. The orebody exposed varies from 4 to 8 ft. wide, and has been tapped on the lowest level, namely 165 ft., where some rich silver veins have also been discovered. The Amalgamated is a property which has for some time been under a bond, but a syndicate headed by S. M. Madden has taken hold of it under option, and surface trenching has disclosed several new veins. Driving is being done at the 100-ft. level on a vein containing silver. The long-standing lawsuit between the La Rose and the Right-of-Way has been decided by the British Privy Council, in favor of the latter. It involved the right to mine a strip 90 ft. wide running through the La Rose property, which was reserved by the Government for railway purposes. The La Rose contended that the reservation covered only surface rights, but the Government thought otherwise, and granted the mineral rights to the Right-of-Way. The Privy Council confirms the Right-of-Way and awards damages of $175,000, the value of ore extracted by the La Rose. The net earnings of the La Rose for November were $93,447, and for the last six months, ending with November, $560,418. The Cobalt Central, in the course of diamond-drilling 350 ft. below the surface, 58 ft. west of the intersection of Big Pete with the No. 2 vein, found a vein carrying 5000 oz. silver per ton, with native silver showing in the wall rock. On the Hargrave property the old shaft is being pumped out, and sinking will immediately begin. A plant has been ordered. A vein recently found on the Temiskaming property has widened to 18 in. The company has declared a 6% dividend. The annual report of the Coniagas showed a production of 1,444,229 oz. silver during the year, making a total to date of 3,444,000 oz. The profits for the year ending October 31 were $501,718. There are 13,000,000 oz. silver by assay in ore blocked, and the underground workings and explorations cover an area of 12 acres. The Flynn property has been secured by Harold P. Davis and others, and it is now known as the Pontiac. Camp buildings are in course of erection, and surface-trenching has unearthed a calcite vein varying from 3 to 12 in. wide, which yields considerable native silver.

The mint at Ottawa is making the first gold coins ever produced in Canada, having received for the purpose about 70 oz. gold from the Dr. Reddick Larder Lake gold mine. They will be British sovereigns, as the dies for the stamping of Canadian gold pieces are not ready. The Gowganda Lake district, sometimes written Gow Ganda, despite the season and the difficulty of access, is attracting a rush of prospectors. Many are reported to be waiting at Elk City until a heavy fall of snow shall enable them to 'hit the trail' on snow-shoes. Many expensive deals in mining properties are reported. Statistics obtained at the recording office, Elk City, show a total of sales amounting to $835,000. The cash payments actually made average about one-fourth the sale price. Everything therefore points to great activity in this region during the spring, when the opening up of the country by roads will render it more accessible.

Work is to be resumed at the Silver Bar, which has been idle for some time, a controlling interest having been

acquired by a syndicate of Toronto and Cobalt capitalists. The shaft is down 80 ft. on good ore, and a new vein has been found on the surface. A strike has been made on the Cobalt Station grounds property, which is being worked by an Ottawa syndicate, the vein being a fissure from 5 to 6 ft. wide on the surface and apparently running into the Cobalt Lake and Nipissing properties.

ZACATECAS, MEXICO.

Bote, Parroquia, & Magistral Mines. — San Roberto Group. — Large Output from Sombrerete.—Gold Near Zacatecas.—La Noria.

The Bote mine, controlled by Roger Kerrison of Ipswich, England, and associates, is a steady producer, and has been active and profitable throughout the period of depressed conditions at Zacatecas. The property has an area of 500 acres, and is developed and operated through shafts, the principal working shaft being 660 ft. deep. The ore is highly silicious, carrying silver and gold in the ratio of about three dollars in silver to one dollar gold. This applies to the bulk of the milling ore. But in the lower workings a body of high-grade ore was opened recently, 300 tons of which assayed 458 oz. silver and 15 oz. gold per ton. On the dumps at the mine are 800,000 tons of ore that, it is estimated, may be milled at a net profit of ₱6 per ton. The reduction works, which have been operated some years as a pan-amalgamation plant, with Chilean mills and the Boss continuous process, at a capacity of 70 tons per day, is being changed to a cyanide plant of 150 tons capacity per day. J. S. Pattinson, the manager, is installing some devices of his own in the newly arranged plant.

La Parroquia mine, belonging to F. O. Palmer, is opened to a depth of 600 ft. This yields chalcopyrite ore. One recent shipment of 400 tons to the Aguascalientes smelter assayed 4% copper and 250 gm. silver; another shipment of 300 tons averaged 12% copper and 400 gm. silver.

The Magistral, owned by C. O. Gilbert, has a strong vein of chalcopyrite ore, striking northeast through a slate country. The vein has a dip of 68°, and varies in width from 2 to 25 ft. It is opened by an adit, which extends 900 ft. on the vein; and a three-compartment incline shaft at the mouth of the adit. From this main shaft extend four working levels, each being from 1200 to 1400 ft. long. The deepest is at 600 ft. from the surface. The plant is well equipped with a double-drum steam hoist and an air-compressor. There is a winze, down 600 ft. below the adit, at a point several hundred feet from the portal; this also is provided with a steam hoist. Close to the main shaft is a concentrating mill, which will undergo some changes before starting again. The product of the mine is easily separated into two general classes of ore—that which can be smelted direct and that which will require concentrating before smelting. The smelting ore assays from 4 to 10% copper, and the milling ore is estimated to yield 2½ to 3%. The composition of the ore, aside from its copper content, consists of 50% silica, 16 iron, and 18 sulphur. Shipments of high-grade ore amounting to 500 tons per month are being made to the Torreón smelter; but Mr. Gilbert anticipates smelting his ore at his own plant by January 1, 1909. His new smelter, which is practically complete, is three kilometres from the mine, near the main line of the Mexican Central railroad, a surface tramway having been built, over which to haul the ore from the mine to the smelter. The latter consists of a 48 by 150-in. copper furnace, manufactured in El Paso; a Connersville blower of 67 cu. ft. displacement, running 150 rev. per min.; two Atlas high-pressure steam boilers, and a slide-valve engine; an 80-ft. steel flue, and a brick stack 102 ft. high. A sampling plant will be erected immediately. C. A. Heberlein, who planned and directed the construction of the plant, states that the intention is to granulate the slag. There is a large tonnage of medium-grade ore at the mine, ready for the furnace, and the equipment is adequate to supply the requisite tonnage to the smelter.

The San Roberto group is a mile east of the Magistral, being on the well known Mala Noche vein, that parallels the other great veins of the district. The San Roberto is under bond to T. F. Van Wagenen, for whom a force of men is at work, under superintendence of A. G. Suydam. A steam hoist and other equipment have been installed. A shaft has been sunk 260 ft., and from it over 2000 ft. of driving has been done on the principal vein, which lies between slate and diorite. The gangue is quartz, containing heavy sulphides. The sorted ore by analysis contains 28 to 36% iron, 30 to 40 sulphur, 10 to 20 silica, 1 to 5 zinc, with 1300 gm. silver and 14 gm. gold per ton. Some lead occurs in small masses. These have not proved important. Some of the best grade ore is shipped as development progresses.

What is known as the gold district lies south of Zacatecas, and comprises a series of quartz stringers bearing precious metals, and said to assay about $10 gold and $3 silver per ton. Within this sub-district are more than 40 partly developed prospects. The fact that much of the ore of the Zacatecas district is suitable for concentration, and may be cyanided successfully, leads to the conclusion that a revival of mining may be started there, even with silver at its present price.

The ore shipments from Mexican Central stations in the State of Zacatecas amount to approximately 4500 tons per month, including ore from the districts of Minillas, Zacatecas, Nieves, Sombrerete, and Chalchihuites. Sombrerete is reached by a 65-mile stage trip from Gutierrez. Here is situated the Sombrerete mine, that has been owned and

Zacatecas, Mexico.

operated for 15 years by Robert S. Towne. In that time it is said to have paid a profit of ₱15,000,000. Ore shipments from this mine to the Towne smelter at San Luis Potosí aggregated 800 tons in October. It is a silicious sulphide ore, assaying ₱70 per ton, mostly silver.

La Noria mine, 12 miles north of Sombrerete, belongs to Pittsburg people, but it is under bond and lease to La Noria Development Co., of which G. C. Palmer of Zacatecas is president. The holdings cover La Noria vein, that cuts through lime and shale. This vein is said to be from 40 to 100 ft. wide, the value of the ore ranging from 18 oz. silver and 0.5 oz. gold per ton to much higher figures, the gangue containing 45% silica and 20 lime. Some successful results have been obtained on this ore by cyanide treatment. The property has been a good producer, and resumption of work is contemplated.

The property of the Maine & Nebraska Mining Co., situated on the Rio Balsas, 1½ miles from the town of Balsas, in the State of Guerrero, is developed by a 400-ft. shaft, 1200 ft. of drifts on the vein, and three cross-cut adits that tap the shaft at the 60, 150, and 300-ft. stations. The vein, which is said to average 25 ft. in width, strikes through granite. The ore is an iron sulphide, carrying gold, silver, and copper, said to run $25 per ton, principally gold. It runs 30 to 40% iron, 10 to 12% lime, and 15% silica. Several cars of this ore have been shipped to the smelters at Aguascalientes and San Luis Potosí. Equipment for a 100-ton smelting plant has been ordered, the installation of which will be directed by W. E. Koch, consulting engineer. A railroad is being built from Balsas to the mine. F. M. Currie and associates are in control of the company.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Losses of mercury are usually greater in proportion to the tonnage treated when employing 'inside amalgamation'. In South Africa the loss is said to be twice as large as when outside amalgamation only is practised. This also involves a loss of amalgamable gold, as much of the escaping mercury is in the form of amalgam.

The magnetite ores of Shasta county, California, commonly occur between an igneous rock intrusive through limestone. The limestone seems to have had little to do, however, with the origin of the deposits. The largest orebodies occur in connection with grano-diorite, and have apparently been formed from the alteration of that rock.

Syenite is practically granite with the quartz omitted. Granites usually contain 70% or more of silica, and rarely as little as 65%. Syenites, on the other hand, generally show about 60% of total silica. True syenite is a rather rare rock. It is likely to be associated with granite, and to grade into it by varying amounts of quartz. Pegmatite dikes occur with syenite in the same manner as with granite.

Screen analyses of the products from hydraulic classifiers should be made upon samples of approximately uniform weight, collected as nearly simultaneously as possible, and should include head, spigot, and overflow. The screening of each sample should be done wet, under identical conditions as to the number of shakes of the sieve and the quantity of water used. The products should then be dried and weighed, percentages calculated, and the results of each group of these screenings plotted on the same sheet for comparison.

The owner of a lode claim is entitled not only to his discovery vein, but also to all other, or 'secondary' veins, as they are termed, which apex within his boundary lines. What extra-lateral rights would be awarded to these secondary veins is a complex problem, but in a general way it can be said that such rights would be limited by the same end-line planes as is his discovery vein, or by planes parallel thereto, passed through the points of departure of such secondary veins from the surface territory embraced within the claim.

Hydraulic classification is never even approximately theoretically perfect. The particles of ore in the pulp are not actually falling under conditions free from interference. They impede each other in their fall, so that large quantities of material which the velocity of the rising current would lift and discharge with the overflow are carried down with the coarse material, or 'spigot product' as it is termed. Another disturbing factor is found in erratic currents within the main upward-moving stream. Although a body of water may be rising in a box, it will have within itself cross and return currents that seriously influence the accuracy of classification. The introduction of fresh water in the form of jets in a classifier is liable to greatly increase this difficulty.

Cement for stamp-battery foundations should be carefully tested. A sample should be screened and 95% should pass a No. 100 mesh sieve. It should stand the ordinary tests for strength, and also the boiling test, which is the most reliable accelerated test indicating the effect of time on cement. In addition, the free lime should be determined, and if in excess of 3%, calculated as $Ca(OH)_2$, it should be rejected. The cement mortar should be rich, a proportion of 1 of cement to 2 of sand being safest. Owing to the excessive vibration of a stamp-mill, the highest quality is requisite.

Is a location valid when the notice reads, in part, as follows: "A distance of 1500 ft. along the course of this vein, running in easterly and westerly direction," etc., the vein actually running in a northerly direction? This question does not make clear whether the general course of the theoretical lode-line of the location is at right angles to the course of the vein, or whether the error is merely one of description in the location notice. If the latter is the case, and the location as staked corresponds substantially to the course of the vein, the monuments on the ground will control, and if the location notice is otherwise sufficient, an error of the character noted will be disregarded. If, however, the claim is actually located at right angles to the course of the vein, which would under such circumstances cross the side-lines, these latter lines become end-lines in the contemplation of the law. They are termed side-end lines, and the locator is entitled only to the length of vein he has covered by his location. To this extent the location would be valid.

Standard solutions of sulphuric and hydrochloric acids require skill and experience in order to be made accurately. For many purposes oxalic acid may be substituted, if phenol-phthalein is used as an indicator. Where the highest accuracy is not required this acid has the advantage of being readily made up by direct weighing of the crystals. A good pulp balance, turning with a centigram, is sufficiently sensitive for this purpose. To prepare a litre of fifth-normal acid requires 12.60 gm. of pure crystallized oxalic acid, which should be obtained in the original sealed bottles put up by a reliable maker, and must be kept sealed, as the percentage of water contained in the crystals changes on exposure to the atmosphere. Distilled water must be used. The solution loses strength appreciably if kept too long, especially if exposed to direct sunlight. Solutions more dilute than tenth-normal decompose more readily, while those much stronger than half-normal may deposit crystals in cold weather. Being somewhat weaker than the mineral acids, it is not reliable with certain indicators, such as methyl orange, but answers all the ordinary requirements of cyanide work.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Unusual Gold Ore.

The Editor:

Sir—Recently I received a sample of gold ore from the Wild Rose group of claims, in San Bernardino county, California. The locality is about 30 miles southeast of Victorville, a station on the Santa Fe railroad, and is, I judge, in the San Bernardino range, not far from Holcomb valley. There is said to be considerable ore like that sent.

The ore is composed largely of a nearly white fibrous mineral, apparently tremolite, a kind of amphibole, and shows visible free gold. To determine the nature of the matrix, I had several thin sections made, and these were examined by A. T. Rogers, professor in Stanford University, who pronounced the fibrous minerals tremolite, with interstitial calcite. When the thin sections are examined with a hand lens, the yellow gold can be seen in the cleavage planes of the tremolite, and the microscope confirms this relation. As the tremolite is perfectly fresh, this might seem to indicate that the gold was deposited at the same time that the amphibole was crystallized, but further study of this interesting occurrence should be made. That the yellow material is gold was determined in the laboratory of L. M. King, of San Francisco.

H. W. TURNER.

San Francisco, November 21.

Better Protection of Mine Investors.

The Editor:

Sir—I have read your report of the discussion of the New York section of the Mining and Metallurgical Society of America on the 'Better Protection of Mine Investors' which appears in your issue of October 31, and I would like to make some comments on a statement made by Mr. J. R. Finlay. He says, "Most English mining companies give information that, I believe, is prescribed by laws which are nearly uniform throughout the British Empire," and proceeds to deal with the information given in the reports issued by several influential companies. I would point out that these reports and detailed statements are not required by the law of the land, but are issued solely for the reason that the directors and managers consider it the best policy to take their shareholders into their confidence. Mining companies are registered under the limited liability company laws, just as any other commercial company. These limited companies are the most convenient organizations for managing big businesses and for attracting the average investor. The law requires that a list of shareholders and directors be published once a year, that a meeting of shareholders be held once a year, that all contracts relating to the issue of shares or debentures shall be published, and that if a prospectus is printed and circulated it shall be filed with the other statements herewith enumerated, at Somerset House. Companies are not bound to issue reports or balance sheets, and if they do they need not distribute them to anyone but shareholders. I would ask: how can the directors of a business be asked by law to issue a minute analysis of its trading account? To do so would be socialism pure and simple. That English mining companies issue such full reports and thus take shareholders and the public into their confidence has nothing whatever to do with the law of the land, but it is due to the general feeling that, unless there are special circumstances to prevent it, the policy of publicity is the right one in mining operations.

Also, I would point out that the laws governing English companies and mining operations are not "nearly uniform throughout the British Empire." In Australia public companies have to issue different returns from what they do in England. In fact, there is plenty of 'home rule' in English colonies.

EDWARD WALKER.

London, November 16.

Aluminum for Reducing Iron.

The Editor:

Sir—Referring to the article by W. H. Seamon on the 'Use of Aluminum to Reduce Iron Solutions,' of which an abstract is given in your issue of November 28, I wish to add my testimony to the usefulness of the method. It is an excellent one, but is not at all new. As much as eight years ago, when I was with a large copper company in Mexico, I was using aluminum for the reduction of iron in sulphuric acid solutions, and I used the method constantly for two years, during which time I made hundreds of iron determinations, and I believe that the method was then quite well known to chemists.

An improvement in iron titrations, however, which is not so generally known, but which is certain to be of great value to technical chemists, is the use of phosphoric acid to counteract the bad effect of hydrochloric acid when titrating by potassium permanganate. The method (first published by myself in the *Western Chemist and Metallurgist* in November, 1907), requires the following conditions. The iron solution must have only a small amount of free hydrochloric acid. This condition may be established by neutralizing the excess with sodium carbonate or with ammonia; an excess of not over 5 c.c. HCl (sp. gr. 1.20) is permissible. The solution may be reduced either by powdered zinc (the reduction being practically instantaneous), or by sodium sulphite, aluminum foil, or granulated lead. The two latter reducing agents are the most convenient. Stannous chloride cannot be used. Powdered zinc (zinc dust) and sodium sulphite give the best reduction in a nearly neutral solution, while granulated lead works with equal rapidity in a strongly acid solution or in one nearly neutral. For aluminum the solution must be more highly acid. After reduction the solution is cooled rapidly and decanted from the lead or aluminum; cold water is added to make the volume about 300 c.c., then 5 c.c. if syrupy phos-

phoric acid (sp. gr. 1.7) is added, and the solution is titrated by permanganate.

The results are exceedingly accurate. I have proved the method to be perfectly reliable, and have been using it constantly for more than a year, frequently running comparative tests by the standard bichromate method, with stannous chloride.

GEORGE J. HOUGH.

Evanston, Illinois, December 6.

Selective Gold Solvent.

The Editor:

Sir—Is there a solvent for gold equal to cyanide of potassium or sodium, for analytical purposes, that will not attack iron or alumina. It is not a question of economy in commercial treatment, but to determine the presence of gold and its possible extraction.

LAY MINER.

New York, December 5.

A National Newspaper.

The Editor:

Sir—I have read with a great deal of interest the editorial in the last number of your journal on the need of a national newspaper; I believe that you have sounded the key-note of a method for educating the people more potent, at least along many lines, than the university itself. It is anomalous that in this country, which rightfully boasts of enormous bequests for educational purposes, the de-educational character of the average newspaper, to mention only one of the many charges that may be legitimately preferred against the press, has not been more generally recognized and more severaly condemned, and that so little of practical value has actually been attempted to lessen the evil.

During the four years of their more mature life a few of our young men and women are taught in the universities the nearest aproach to truth that the best thought, acting with the purest motives, can give. For the remainder of their lives these few, together with the great mass of the people, are constantly fed through our daily press with willful misrepresentations, corrupting suggestions, fawning syncophancy, baneful superstition, misleading science, and general error. It is difficult to over-estimate the power for good that would result from giving the people an opportunity to read newspapers conducted on sane lines. Universities, libraries, and hospitals are built and endowed by public-spirited philanthropists. What patriot will make possible, by suitable endowment, the publication of independent daily newspapers, within the reach of all, that shall fearlessly print the truth, the whole truth, and nothing but the truth?

C. L. WHITTLE.

Boston, December 4.

Drills for Quarry Work.

The Editor:

Sir—I note 'Halifax's' request for information regarding drills for quarry work, in your issue of December 5. During the past two years I have been using a Davis Calix drill for boring prospecting holes in firm sandstones and shales; during this time I have bored upward of 24,000 ft. of holes, averaging about 300 ft. each. The holes have all been vertical and from the surface, using tempered steel rotary bits, producing 2⅛-in. core from a hole a little less than 4 in. diam. We operate the drill with a gasoline engine, with water under natural pressure to raise the finer borings. We have operated the drill continuously, with two shifts of 12 hours each, and make as high as 40 ft. in 24 hours, under favorable conditions, averaging 30 ft., including time occupied in moving. Holes are bored 50 to 100 ft. apart. The deeper the hole, the slower the progress. This drill should work well for quarrying in favorable rock, but the saw-tooth bit will not stand very hard rock; the makers recommend a chilled-shot bit for hard rock, but we have no occasion to use it. I shall be pleased to give further information regarding our work, upon request.

B. M. NEWCOMB.

200 Davis St., San Francisco, December 8.

Re-Location and Amended Location.

The Editor:

Sir—I venture to criticise the definitions of 're-location' and 'amended location' which appeared in 'Concentrates' of your issue of November 28. These terms are quite susceptible of confusion, and are frequently used very loosely by the authorities. A re-location, as the term implies, is a new location of ground included in a claim which has had previous existence and been abandoned or forfeited. Instead of "differing from the previous one in position or size of the claim," it is not, strictly speaking, a re-location as to any territory not included in the former location, and probably in the majority of cases a re-location covers substantially the same ground as was embraced in the abandoned or forfeited claim.

An amended location, on the other hand, presupposes the existence of a valid location at the time of the amendment, which valid location is the subject of the amendment. Locations are amended for the purpose of altering "the position or size of the claim," to cast off excess, to include abandoned ground, parallel end lines, and, as is correctly stated in your definition, to correct errors in the location papers, and the like.

WM. E. COLBY.

San Francisco, December 4.

Copper Deposits of White Horse.

The Editor:

Sir—In your issue of December 5 appears an article under the above title. I wish to correct the information you obtained relative to the gold values contained in the ores of the Arctic Chief mine.

Sample shipments aggregating 737 tons of ore have been made from this property to the Crofton, Tyee, and Tacoma smelters; returns from same show an average of 0.194 oz. gold, 1.54 oz. silver, and 4.45% copper per ton.

CHAS. P. ROBBINS.

Spokane, December 10.

PRESERVATION OF TIMBER.

Written for the MINING AND SCIENTIFIC PRESS
By F. H. MASON.

The preservation of timber has become an exceedingly important problem, not only because there is economy in using timber that by special treatment has been rendered less liable to rot in places where it is particularly prone to the ravages of decay, but also because the consumption of timber in modern industry threatens the annihilation of our forests.

The treatment of timber with antiseptics, with a view to preserving it from decay, dates back to the commencement of the eighteenth century, when timber was immersed in a solution of corrosive sublimate. The strength of the solution used was from 0.75 to 1.5%, and the timbers were allowed to remain in this solution from 1 to 30 days, the length of time varying with the dimensions of the timbers. About the middle of the eighteenth century copper sulphate solutions of similar strength to those of mercuric chloride were used for preserving timber. Finally, in the early part of the nineteenth century zinc chloride was tried, and although little used at first, it came into considerable favor as a preservative. While a number of other salts have been used from time to time, the foregoing have proved to be the most useful, and they have all been applied with success. The objection, however, to all of them is that the antiseptic salts left in the timber are soluble in water, having been originally conveyed there by that medium, so that when the timber is subjected to leaching action, as in wet mines, this form of treatment is not applicable. It is true that in the case of some antiseptics a small portion of the salt is chemically changed by the timber and rendered difficultly soluble, but it is not rendered sufficiently insoluble to withstand the leaching action of water in wet mines, especially if the mine waters are acid, nor is enough of it so chemically changed to form a preservative if the more soluble portions are leached out. It will undoubtedly occur to many readers, as it has to the writer, that the difficulty in connection with the leaching out of the antiseptic salts by mine waters might be overcome by precipitating a difficulty soluble poisonous salt within the timber, a salt which, while being soluble enough to be poisonous, is sufficiently insoluble to be unaffected by leaching with mine waters. This could be accomplished by double immersion, preferably under pressure, and partly drying the timber between the two immersions. A number of combinations of salts will suggest themselves for this purpose. Timber has been rendered effectively fire-proof by the precipitation of difficultly soluble salts within its pores, and there appears to be no good reason why it should not be rendered proof against decay by a similar process.

Creosote appears to have been first tried as a preservative for timber at the beginning of the nineteenth century. The early experimenters, wishing to economize creosote and at the same time obtain an even impregnation, attempted to use the creosote in a gaseous form. The boiling points of creosote, however, being considerably above the temperature to which it is possible to heat wood without destroying its fibre and greatly diminishing its strength (it is not considered safe, from an engineering standpoint, to heat wood above 250° F.), caused these efforts to fail. An attempt was next made to force creosote into timber by the aid of superheated steam; this too was doomed to failure, for unless the creosote was heated to a temperature above that at which it would not injure wood, only the more volatile constituents of the creosote were carried by the steam beyond the immediate vicinity of the surface of the timber. It remained for Breant, a metallurgist, and at the time (1831) director of the Paris Mint, to be the first to suggest the process of filling timber with creosote by immersion under pressure. The process, modified by Bethell and afterward by Burt, is in use in many parts of Europe today. The timber, which has usually been seasoned, is packed on iron trucks and run into wrought-iron cylinders from 6 to 8 ft. diam. and from 30 to 100 ft. long. The cylinder is then hermetically sealed and the air pumped out until the gauges show a vacuum of from 20 to 26 in., which is maintained for some time, in order to get the greater portion of the air and moisture out of the sap canals. Creosote at 120° F. is then allowed to flow into the cylinder, filling the partial vacuum, and when the cylinder is full it is put under a pressure of from 100 to 150 lb. Gauges show the quantity of creosote that passes into the cylinder; the capacity of the latter and the quantity of timber within it being known, it is possible to pump the exact amount of creosote demanded by the specification. The creosote is kept under pressure for several hours and maintained at a temperature of 120°F. by steam coils. The disadvantage of the foregoing process is that it is unsuited for freshly cut timber, or timber that is soaked with water. To overcome this, Boulton added a dome to the treatment cylinder; at the top of the dome he placed a pipe connecting with the vacuum-pump. The timber freshly cut or water-soaked from the ponds is loaded into the cylinder and the air exhausted, as previously described. Creosote at 212° F. is allowed to flow in, and the vacuum-pump kept working until it rises to the base of the dome, a glass gauge indicating when it reaches that point. The creosote is maintained at 212° F. by steam coils, and the water-vapor driven from the wood rises into the dome, and is sucked away by the vacuum-pump. It is claimed that 10 lb. per cu. ft. can be charged into the timber by this method; there must, however, be a considerable loss of naphthalene, and unless the original creosote contained an unusually large proportion of that substance, I should expect the creosote in the timber to be deficient in naphthalene.

At Norfolk, Virginia, the Norfolk Creosoting Co.'s plant consists of two batteries, the one of three, and the other of two cylinders.* These cylinders are from 120 to 125 ft. long and from 6 to 6½ ft. diam.; they are set in brick and are provided with heavy steam-tight doors, which are fastened in place by

*I desire to thank Mr. C. E. W. Dodwell, engineer to the Dominion Government at Halifax, for the details of the creosoting plant at Norfolk, Virginia.

lug-bolts. Each battery is provided with a large vertical vat set in brick; in this the creosote is heated, and two vertical storage vats (supplied with gauges to indicate the amount of creosote contained in them) in which the creosote is measured before delivery into the treatment-cylinders. These vats and the treatment-cylinders are provided with steam coils, so that their contents may be maintained at any desired temperature.

In all large contracts it is customary for the buyers to be represented by an inspector, whose duty is to see that the proper quantity of creosote is forced into the timber, and also that the creosote is of the quality specified. The timber to be treated is measured and run into the cylinders on iron cars, the cubic contents of which are known, the doors are bolted in place, and the cylinder is filled with steam at a temperature of from 250 to 275° F. (in the case of water-soaked timber the temperature is allowed to reach 285° F. for the first half of the period), and under a pressure of from 35 to 55 lb., and maintained under these conditions from 5 to 7 hours. The cylinder is then emptied of water and sap through a draw-off cock at the bottom, and the vacuum-pump is started, a vacuum of not less than 20 in. being maintained from 5 to 8 hours. The temperature within the cylinder during this period is kept between 100 and 130° F. The draw-off cock is once more opened and the cylinder is entirely emptied of water and sap; the vacuum-pump is then put into operation until a vacuum of about 25 in. is obtained. The creosote in the storage vats is now measured in the presence of the inspector, and is then allowed to flow into the treatment-cylinder, and the vacuum-pump is kept going until the latter is quite full. The inspector now draws off a sample from a cock at the side of the cylinder and makes a fractional distillation of the creosote; if the latter is of the specification demanded, a pressure of from 30 to 150 lb. (varying with the amount of creosote with which the timber has to be filled) is maintained until the gauges in the storage vats indicate that about the proper quantity of creosote has been forced into the timber. The creosote is maintained at a temperature between 130 and 180° F. during the treatment. A pressure of 30 lb. for three or four hours is generally sufficient to charge the timber with 10 lb. of oil per cubic foot, and cause a penetration of 1½ in. from all surfaces. A charge of 25 lb. per cu. ft. requires a pressure of 100 lb. for 8 to 10 hours. When the treatment is completed, the creosote is pumped from the treatment-cylinder back into the storage vats and the gauges read in the presence of the inspector, the difference between the first and the final reading indicating the amount of creosote that has been forced into the timber. It is generally arranged that the temperature of the oil shall be the same for both readings, otherwise a correction would have to be made for the difference in temperature.

With regard to the oil used, the Norfolk Creosoting Co. guarantees that all oil shall be dead oil of coal tar, containing not more than 1.5% water, nor 5% of tar, nor 5% of carbolic acid. It shall not flash below 185° F., nor burn below 200° F. It shall begin to distill at 320° F., and the fraction distilling between that temperature and 410° F. shall not be more than 20% of the whole volume. The fraction distilling between 410 and 470°F., which is taken as naphthalene, shall not be more than 60% nor less than 40% of the whole volume. It shall be fluid at 118° F., and at that temperature its density shall lie between 1.015 and 1.05.

The following may be considered to be an average fractional distillation of the dead oil of tar used while the Norfolk Creosoting Co. was filling an order for the government of the Dominion of Canada:

	Temperature of Fractions, Degrees Centigrade.	%.
Water, hydro-carbons, and phenols	Below 170	0.4
Phenols and creosols	170 to 205	2.2
Phenols and naphthalene	205 to 210	2.7
Naphthalene	210 to 235	39.6
Naphthalene and anthracene oils	235 to 240	7.5
Anthracene oils	240 to 270	15.3
Anthracene	270 to 316	10.6
Residue	Fixed below 316	20.8
Loss		0.9
		100.0

The fraction distilling between 210 and 235° C. and half of the fractions distilling between 205 and 210° C. and 235 and 240° C. are taken as naphthalene. I have found that this method of determining naphthalene gives results from 3 to 6% higher than the method of separating by filtration from the combined distillate.

Discussion has arisen from time to time as to which of the various ingredients of creosote is responsible for its property of preserving timber. In the early days the tar acids (carbonic and cresylic acids) were supposed to be wholly and solely responsible for the preserving powers of creosote, but analyses of railway ties that had been in use for a number of years, and which were in perfectly sound condition, showed only traces of these acids. Such a result was rather to have been expected, because both acids are volatile at ordinary temperatures and are also appreciably soluble in water, while neither of them enters into permanent combination with albumen or woody fibre. After the apparent exploding of the theory that the tar acids were the essential ingredients of creosote necessary for the preservation of wood, the pyridine series of hydro-carbons came into favor, especially acridine, and specifications demanded varying quantities of these ingredients. Today naphthalene is demanded, often in quantities in excess of that in which it occurs in ordinary dead oil of tar, so that it has to be added to meet the specification. Naphthalene is particularly demanded for timber that is to be submerged either wholly or partly. It is also demanded that the creosote shall contain a considerable amount (generally not less than one-fifth) of heavy oils fixed at a temperature of 600° F. This is specified because the heavy oils fill up the pores of the wood and prevent the volatilizing of naphthalene and phenols, and also prevent the infiltration of water and consequent solution of the tar acids. Nearly all specifications demand that the creosote shall have a density varying between 1.035 and 1.065.

the object of this being to prevent adulteration with crude mineral oil.

Creosote, or dead oil of coal tar, as it is more properly called, to distinguish it from wood creosote, is that fraction which distills over from coal tar between 204 and 404° C. or 399.2 and 779.2° F. The distillate is far from being of constant composition. It contains varying quantities of naphthalene, phenanthrene, anthracene, pyrene, chrysene, carbazole, benzerythrene, and other solid hydro-carbons; carbolic and cresylic acid, and some of the higher phenols are invariably constituents, as are also basic substances of the pyridine series. The density of creosote usually lies between 1.02 and 1.07, but there are marked exceptions to this. The quantity and quality of creosote obtained from tars varies not only with the coals from which the tars are derived, but also from the manner in which the coals are coked. Thus, Lung found 1.53% of naphthalene in the tar obtained from coal coked in a modified beehive oven heated with external flues, and 7.69% of naphthalene in the tars from the same coal coked in an Otto-Hoffmann oven. While creosote commences to boil at 204° C., some of its ingredients are markedly volatile at ordinary atmospheric temperatures. This fact was vividly brought to my notice some years ago: I had been making some analyses of creosoted timber, and I put a piece 12 by 12 by 12 in. away in a tin box and pasted a piece of glazed paper around the joint between the box and the lid. When I opened the box some four months later, the lid and the sides of the box were covered with plates of naphthalene, which had volatilized from the timber. The temperature of the laboratory certainly never exceeded 90° F., and probably averaged about 65° F. The sample was an end piece of timber and saturated with creosote.

The industry of creosoting timber offers a tempting opportunity for fraud, not only by insufficiently 'filling' the timber, but also by adulterating the dead oil used. It therefore behooves purchasers to keep a careful watch on the product supplied to them, for a poorly filled timber or one filled with bad material may sometimes be even worse than an untreated timber. To be assured that an order of timber is filled with the specified quantity and quality of creosote is not an easy matter. The first essential is to get a thoroughly trustworthy and capable inspector, and it is necessary to corroborate his work by analysis of the treated timber, for the pipes connecting the feed from the storage vats are generally concealed, and if it were desired to do so, it would be possible to deceive any but a very inquisitive inspector.

By whatever process the timber has been treated, it will be impregnated an average distance from all external surfaces, and along the sap canals for some distance from the ends of the timber; therefore, in all but short timbers we should expect to find, and do find in sound timbers, that the heart wood in the centre of the timber and an area around it contains but little or no creosote (Fig. 1). Should the timber be shaken, that is, cracked in drying, creosote will enter the cracks and be conveyed to the heart of the timber. It will be evident that, with the exception of perhaps two feet at the ends of the timbers which will be saturated (that is, provided an honest endeavor has been made to fill the timber), no two sections (say, half an inch thick) cut from different parts of the timber will contain the same amount of creosote; so that, in order to get an average, it would be necessary to take a number of sections from different parts of the timber. In dealing with big timbers, 20 to 60 ft. long, on account of the cost, the purchaser is loath to cut up even a single stick for the purpose of analysis unless there are distinct indications of fraud on the part of the manufacturer, and if the consignment were a big one, a single stick would be a poor proportion for a sample. It is apparent, then, that to attempt to obtain an absolutely accurate sample would not only be costly, but would probably be futile, and, after all, the object of the sampling and analysis is not to find the exact amount of creosote in a stick of timber so much as to find if the manufacturer is making an

Fig. 1.

honest endeavor to live up to his contract. Taking into consideration the foregoing, the plan I have adopted is to find out at what lengths any of the timbers have to be cut, and going upon the basis that the greatest amount of creosote is to be found at the ends and the least in the middle of the timber, it is possible to select from the timbers that have to be cut a sample that will sufficiently nearly approach an average for the purpose desired. Having selected the timbers from which the sample is to be taken, it is always possible to have a section half an inch thick cut from them. These sections are placed in a tin and sealed, a piece of adhesive tape used by electricians being a good material to seal the joint between the box and the lid. When the samples reach the laboratory the centre of the heart wood, where there is least creosote, is taken as a centre and lines drawn to the sides of the section, every other, every third, or every fourth of the divisions thus formed (as the case may demand) is taken for the sample. The quantity to be taken for analysis is such that it will contain from 80 to 120 gm. creosote; this, after it is weighed, is cut into fairly coarse shavings with a metal plane, the shavings are put into the extractor, and when the apparatus is set up, the plane is rinsed

with alcohol, which is poured onto the shavings in the extractor.

The extractor I have used (Fig. 2) consists of three parts: 1. The flask, in which the solvents are boiled. 2. The cylinder containing the shavings. 3. The condenser, in which the vapors of the solvents are condensed. As a solvent I use a mixture of three parts alcohol and one part ether. As the extraction often takes 10 or 12 hours, it is advisable to place the flask on a self-filling water-bath, so that it may be left running during the night without the danger of causing fire. The cylinder is made of copper, tinned on the inside; it is about 4 in. diam. and 18 in. long, and terminates at the bottom in a funnel. The pipe of the funnel that goes through the cork of the flask is cut at an angle of about 60°, in order that the condensed solvent may fall from the point and not stop up the pipe. At a point where the funnel is about 2 in. diam. a piece of copper gauze is soldered. The lid of the extractor, which is conical in shape, it attached to the cylinder by a substantial brass screw and nut, the former being soldered to the cylinder, and the latter to the lid. The apex of the cone is cut off; a half-inch copper pipe, about 21 in. long, passes through it and projects about ½ in. on the inside, and is cut off at an angle of about 60°; immediately underneath this pipe is fastened the apex of a cone about 2 in. diam. at the base and held in place by three wires soldered to the inside of the lid. That part of the pipe outside of the lid is surrounded by a water-jacket to form a condenser. The object of the cone within the lid is to spread the liquid condensed in the pipe over a large area. The pipe at the bottom of the extractor passes through a bored cork into a Jena glass flask.

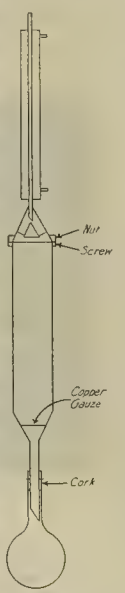


Fig. 2.

To make the assay, a quantity of shaving that will give from 80 to 120 gm. of creosote is placed in the cylinder and gently rammed down, the lid is screwed on, a thin sheet-lead gasket being placed at the joint. The flask is now connected and placed on the water-bath, and water is circulated in the condenser. A mixture of three parts alcohol and one part ether is poured in at the top of the apparatus, a little at a time, until the flask (which is of about 600 c.c. capacity) is from half to two-thirds full. The burner is then lighted and the extraction commences.

The principle of the operation will be evident: the vapors of the solvents rise up through the copper pipe into the cylinder. Some of these vapors will be condensed in the cylinder, some will pass through the cylinder and be condensed in the condenser, in either case the condensed solvents will pass through the wood shavings back into the flask, taking creosote with them. Thus, the same solvents are used over and over again, and each time they are condensed they bring a fresh portion of creosote into the flask, until the whole of the creosote is removed from the shavings into the flask. If there is much water in the timber it will be found necessary to change the flask and use fresh solvents after the operation has been going on for an hour, or possibly less, otherwise the bumping is likely to break the flask and ruin the assay. When the extraction is nearing completion, which will be evident from the condensed liquid dropping from the extractor being colorless, the flask must be changed and fresh solvent used. This is necessary on account of the fact that naphthalene, one of the principal ingredients of creosote, distills over in marked quantities with alcohol vapor from moderately concentrated solutions, but not appreciably from dilute solutions. When the extraction is complete the various extracts are all mixed together and the solvent separated from the creosote by distillation. When nearly all the solvent has distilled over, which will be evident from the rise in temperature of its vapor, the creosote is transferred to a tared hard-glass retort, of about 350 c.c. capacity, the retort is fitted with a Jena glass thermometer filled with nitrogen, and having a range of from 80 to 350° C., visible outside the cork. The bulb of the thermometer should reach within ⅛ in. of the bottom of the retort. The retort is now placed in an air-bath (Fig. 3), asbestos fibre or wool glass is packed around the neck and around the thermometer, and it is raised to a temperature of 100° C., and kept at that temperature until no further distillation takes place; it is then allowed to cool and is

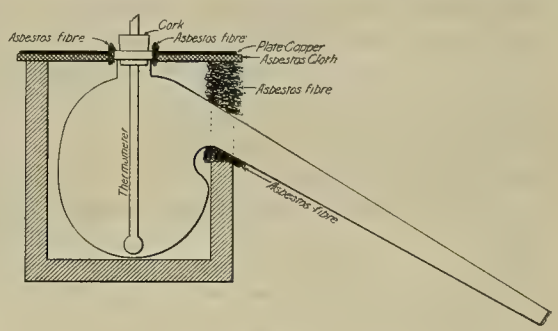


Fig. 3.

weighed. The distillate, which contains naphthalene, is measured and two or three lots of 10 c.c. are allowed to evaporate spontaneously in a tared dish, which is then dried in a desiccator and weighed; this weight, less the tare of the dish, gives the amount of naphthalene in 10 c.c.; from it the quantity of naphthalene in the distillate is calculated, and added to the creosote found. The retort contains resin and other ingredients of wood soluble in alcohol and ether, as well as all the creosote; to separate the last from the former is not an easy problem; it is tedious and costly; but there is another way out of the difficulty which will meet the case. As I have already pointed out, the sampling is far from being accurate; under these conditions it is useless to carry the analysis to complete accuracy. Samples can be obtained from the manufacturers of the wood they are treating after it has been through the steaming process and before it has been creosoted; these samples can be classified into three or four grades by their appearance, and extractions made from them similar to that made of the creo-

soted wood. The creosoted timber to be analyzed is compared with uncreosoted samples and deduction made accordingly for resin, etc. Fractional distillations are made of the resin and sap extracted from untreated timber, in order to make corrections of fractional distillations of creosote containing the same. The wood shavings from which the creosote has been extracted are dried and weighed, and the difference between their weight plus the creosote, resin, etc., obtained, and the weight of the original sample taken, is the weight of water in the wood taken. With regard to the analysis of creosote, this is often not left to the analyst's discretion, the specification demanding certain tests rather than an analysis. A favorite English specification, originally devised by Sir Frederick Abel, demands:

1. The density shall not be less than 1.035 nor more than 1.065.

2. The creosote shall be liquid at 100° F., and no solids shall separate until the temperature falls below 95° Fahrenheit.

3. The creosote shall contain not less than 25% of material not volatile below 600° Fahrenheit.

4. The creosote shall contain not less than 8% of tar acids, which are to be determined by washing the distillate obtained from No. 3, three times with caustic soda solution of a density of 1.2 and acidulating the mixed washings with dilute sulphuric acid (1 acid 3 water) and allowing the tar acids to separate in a separating funnel. The separated acids to be dissolved in caustic soda solution, filtered through glass wool, the filtrate acidulated with dilute sulphuric acid, placed in a narrow graduated glass tube to settle and the percentage of tar acids by volume read.

5. The creosote to contain not less than 25% of naphthalene, which is to be determined from the distillate from No. 3 by cooling it to 32° F., filtering it at that temperature, and pressing the residue between absorbent paper, and weighing.

In Canada and America the custom is to demand a fractional distillation. A demand of from 25 to 50% of naphthalene is made, and also that the residue fixed below 316° C. shall not be less than 20 to 30 per cent.

Besides, for the purpose of mine timber, railway ties, and wharf posts, creosoted timber might be advantageously used for sills of pit-heads, aerial tramway towers, many buildings, and a number of other purposes. The butt ends of telegraph and telephone poles are frequently creosoted in Europe. Whatever be the use to which creosoted timbers are put, one important point should be borne in mind: when a timber is cut, or when notches or mortises are cut in it, these often reach beyond the protected portion of the timber, and unless these places are well coated with creosote to prevent the inroad of rot at these points to the interior of the timber, the value of the creosoting is to a great extent lost. A pot of creosote and a brush should form part of a timberman's kit when working with creosoted timber. With regard to the quantity of creosote with which it is necessary to charge wood in order to insure it against decay, indisputably the nearer it approaches saturation the longer will be its life, but it is often not practicable to fill wood to this extent. Owing to the fact that a considerable quantity of creosote enters the wood through the sap canals, a much greater amount of creosote is found in the ends than in the middle of timbers. The manufacturers only guarantee to put a specified quantity of creosote into an order of timber; they do not and can not guarantee to fill every cubic foot with the specified amount of dead oil. For this reason, when making out a specification it is necessary to take the length of the timber into consideration. When incisions have to be made in timbers at regular known points, they should be made before the timber is treated.

It is generally conceded that a well creosoted timbey (say, a timber which is impregnated with good heavy dead oil of tar for not less than two inches from all surfaces) is better able to withstand the ravages of decay under all atmospheric conditions than a timber treated by any other process. On the other hand, the great disadvantage to creosoted timber, especially for use in mines, is their inflammability, and in the event of fire, the suffocating acrid fumes evolved preventing access to the neighborhood of the fire. Timbers treated with mineral salts, on the other hand, are usually much less inflammable than untreated timbers, some of them being practically fire-proof.

Occasional tests should be made of the strength of creosoted timbers, because there is no doubt that a number of manufacturers exceed the safe limit of temperature in 'steaming' the timber, and thereby considerably impair the strength of the product.

Cementation index is the name given to a formula designed to express quantitatively the relation between the composition of cements or raw materials and their hydraulic value and strength. The formula is as follows:

$$I = \frac{2.8SiO_2 + 1.1Al_2O_3 + 0.7Fe_2O_3}{CaO + 1.4MgO}$$

in which I is the cementation index and the component parts are expressed in percentages of the total weight. The formula is particularly valuable for investigating the probable adaptability of raw materials for the manufacture of cement or hydraulic lime, as well as for calculating the mixtures of untried raw materials. The ideal portland cement will have a cementation index of unity, and for most good cements now on the market the value is between 1.00 and 1.20. A high cementation index means a high-limed and low-clayed cement, and a low index indicates the reverse. The value for natural cements will generally be between 1.15 and 1.60, and for slag cements between 1.60 and 1.90. It must be noted, however, that in the case of raw materials the cementation index indicates what may be done with proper methods and manipulations, but that many factors enter into the final result. For instance, a material having a cementation index of 1.05 might be a hydraulic lime, a natural cement, or a cement of the portland type, depending chiefly on the temperature at which the raw material was burned.

NEW PLACERS IN ALASKA.

Three new localities for placer gold in the lower central part of the Yukon valley, brought to the public notice within the last two years, are of particular interest because they show that the gold-bearing formations of the valley are of much wider extent than has generally been supposed.

Last summer A. G. Maddren, of the U. S. Geological Survey, made reconnoissance trips to these localities, which are known as Gold Hill, Ruby Creek, and the Innoko.

The Innoko district is more widely known and discussed than the Gold Hill or the Ruby Creek district. Since the discovery of placer gold in paying quantities, in 1906, on some of the headwater tributaries of Innoko river, that part of Alaska has received more attention from prospectors looking for new fields than any other district in the Yukon valley. Probably as many as 2000 men have visited the Innoko country and remained there for the whole or part of a season. Many of these men have come from the older placer districts up the Yukon, especially from Fairbanks; some have come from Nome, and a few from the smaller settlements on the lower Yukon.

The Innoko, the lowest noteworthy tributary of the Yukon entering from the left, is about 500 miles long, and has been the principal route to and from the diggings on its headwaters. During 1906 small stern-wheel steam-boats ran up the river to Dichkakat, about 250 miles from Anvik, on the Yukon. From Dichkakat it is 190 miles farther by the river to Ophir, the principal settlement of the diggings, and this distance is traveled in poling boats that will hold about one ton of freight. The most serious drawback to prospecting in the Innoko country is the difficulty and cost of getting supplies to a centrally located distributing point convenient to the creeks on which pay gravel has been discovered. So far most of the provisions have been shipped into the district from Fairbanks, and by the time the freight is delivered at the town of Ophir the transportation cost has reached the enormous sum of $500 per ton.

The Innoko country has been staked in a wholesale manner, about 1200 locations being on record. Of this number only about 25 claims were worked during the summer of 1908, and practically all of these were on Ganes, Little, and Ophir creeks. About 150 persons are now wintering in the Innoko district.

The name of Gold Hill is applied to an area in the central Yukon valley, about 25 miles below the mouth of Tanana river, that lies along the north side of the Yukon and extends westward from the western slopes of the valley of Tozitna river to the higher mountains north of the United States telegraph station called Birches. Roughly, the district embraces an area extending 30 miles east and west and 20 miles north and south, covering about 600 square miles. Most of this area consists of mountains that form a divide extending east and west about midway between the main courses of the Yukon and the headwaters of the Melozitna. This divide separates the region into two areas that are drained to the north and south by creeks of moderate length and volume.

The principal southward-flowing creeks, named from east to west as they join the Yukon, are Grant, Illinois, Mason, and their tributaries; those flowing northward into the Melozitna, named in the same order, are Moran, Eureka, Hudson, Langford, and Tiffany creeks and their tributaries. It is in the gravel deposits of these creeks that the placer gold is found. Practically all the alluvial ground on these streams has been located for placer mining. The locators are mostly association groups that enable a few men actually present on the ground, presumably provided with powers of attorney from a number of absent persons, to tie up completely many thousands of acres of alluvial deposits bearing placer gold. The result of this practice is that many intending workers are unable to acquire ground rights, and that the healthy growth of the placer-mining industry is being retarded in a very discouraging manner.

Open-cut ground-sluicing operations have been be-

gun at several localities in the Gold Hill area, but owing to the scarcity of water, due to the unusual dryness of the summer of 1908, there has been thus far very little production of gold.

The area known as the Ruby Creek district lies on the south bank of the Yukon, directly south and opposite the mouth of Melozitna river, about 175 miles below Tanana, or 110 miles above Nulato. For a distance of 10 miles along the south bank of the Yukon the Ruby Creek country presents rolling hills from 400 to 500 ft. high that overlook the river with bluffs 200 to 300 ft. high. This district received considerable attention from prospectors in the winter of 1907-08. Large tracts were located as placer-mining ground on Ruby, Melozi, Big, Main, Boston, Bonanza, Beaver, and Dome creeks, and their tributaries. A number of holes were sunk to bedrock during the winter, and prospects of gold are reported to have been found at several places. Discovery claim, on Ruby creek, was the only property actively worked in July, 1908.

The ordinary house fly has been under study by investigators in Brooklyn, one of whom has established the fact that the greatest number of diarrheal deaths occur at the time when the number of flies is the greatest. Eighteen flies from around swill-barrels were found to have 118,800,000 bacteria on them.

COPPER-GOLD SMELTING AT MAGISTRAL.

Written for the MINING AND SCIENTIFIC PRESS
By ROBERT LINTON.

The Magistral mines, owned by the Luster Mining & Smelting Co., are situated near Santa Maria del Oro, Durango, 50 miles from Rosario, on the Mexican Central railroad. They yield a gold-silver-copper ore, about 85% of the total gross value being in the gold. After more than 18 years of discouraging results, due to the failure of different methods of ore-treatment, it was decided to resort to copper smelting, using the copper as a collector for the precious metals. By courtesy of R. W. Bissell, general manager for the company, who designed and built the present smelter, I am permitted to give the following account of the plants and practise.

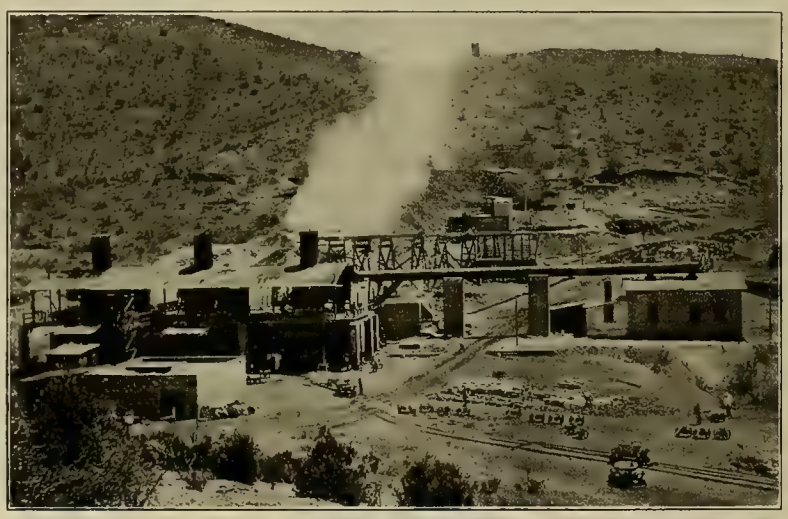
Tap-Floor, Magistral Smelter.

The history of the early operations of the company records a strenuous endeavor to keep away from smelting. This is natural, as the running of a smelter 50 miles from a railroad is a costly undertaking. The first plant was a 40-stamp mill with plate amalgamation, but the ore was not sufficiently free-milling to yield a satisfactory recovery. Chlorination was subsequently employed, then cyanidation, but neither proved successful.

The first attempt to apply smelting methods was made about 8 years ago. At that time the bulk of the ore mined was high in sulphur, and this suggested the possible application of pyritic smelting. Two cylindrical blast-furnaces, 36 in. diam., with hot-blast stoves, were built and run for several months on the richer sulphide ore, the charge carrying about 30% sulphur. As the results were not satisfactory, the furnaces were torn down and two others of the same general type built, 42 in. diam., these in turn being replaced by two 48-in. furnaces. A number of modifications were introduced, as experience in operating suggested, but the best results were nevertheless far from satisfactory.

Two furnaces were then built on the lines of copper matte blast-furnaces, 42 by 120 in. at the tuyeres. They reached a capacity of 100 tons of charge per 24 hr., or 2.9 tons per square foot of hearth area, on a charge carrying 22% sulphur. The results were generally much more satisfactory than has been obtained in running the cylindrical furnaces, sufficiently so to demonstrate the entire feasability of smelting the ores, even with the long overland haul of the coke and matte. It was therefore decided to build a new smelter of increased capacity and improved design, which is now in operation.

The smelter is at the Cocinera mine, from which the bulk of the ore comes at present. It occupies a central position for the whole group. It stands on a hillside, affording ample room for slag-dumps below and ore-bins above. The latter have not been built, as yet, in accordance with the original plan, and the ores are stocked and mixed on the open patio. The system of ore-bins when installed will permit of better bedding of the charges in advance of requirements, which will be of material benefit to the plant.



Smelter at Santa Maria del Oro, Durango.

The smelter has three blast-furnaces, designed by Mr. Bissell, and Frank B. Hine, smelter superintendent. Each is 40 by 168 in. at the tuyeres, and has McDonald hot-blast stoves. The sides of the furnaces are vertical for 7 ft. above the tuyeres, which is the ordinary height of the charge column, and the receiving plate runs from this point on a 45° slope to the

charging-floor 3 ft. above. The long receiving plates retard the fine material in the charge, which in consequence falls along the sides of the furnaces, while the coarser portion of the charge is thrown to the centre. While the charge column is usually held at a height of 7 ft. when the charge is highly basic, the furnace is charged full to the floor-level, in order to afford the proper desulphurizing roast before the charge reaches the smelting zone. In a new furnace the spouts to the settlers are at the bottom of the furnace, so that there is no crucible except such as is formed by the wear of the bottoms. The latter are built 30 in. thick, all of local brick except immediately around the spouts, where chrome brick is the only sufficiently refractory material yet found.

Each furnace is provided with two settlers, one on each side, in order to facilitate repairs without inconvenience or interruption in operating. The settlers are circular, 69 in. diam., 36 in. deep, inside of the fire-brick lining, when new. The shells are of ⅜-in. boiler plate. There are two slag-taps set equidistant from each other and from the furnace-spout, the bottom of the taps being 6 in. below the top of the shells. The matte-taps are level with the bottom of the settlers. The maximum height of matte in the settlers is therefore 30 in.; 10 in. is usually drawn off at a time, and 20 in. left in the settler. The average life of the linings, which are built of local brick, is 26 days. Water to the jackets flows under an 18-ft. hydraulic head through an 8-in. pipe-line from the reservoir, with a 6-in. connection to each furnace, a 3-in. branch leading from this to each jacket. From the top of the jacket the water flows through a 2-in. outlet-pipe and discharges into a tank from which it is returned to the reservoir by two 4 by 5-in. Gould pumps. The water is lifted vertically, discharged into a launder in which it flows to the cooling tower, and thence back to the reservoir. Each furnace uses 700 gal. water per minute, fed at 10 to 12° below the temperature of the atmosphere and discharged at 160 to 180° F. The free discharge from the 2-in. outlets is so situated as to be conveniently observed from the charging floor. The consumption of fresh water is 1000 cu. ft. per 24 hr. for each furnace, which includes what is used for sprinkling and cooling on the charging and tap floors, as well as evaporation.

There are 16 tuyeres on each side of the furnace, 5 in. diam., bushed to 4¼ in., set 10 in. between centres, each provided with a quick-opening gate-valve. The bustle-pipe is of No. 8 gauge iron, 24 in. diam.; one branch pipe, 32 in. diam., leads to each furnace from the blast-main; the latter is 52 in. diam., which is larger than is required for the present furnace capacity, the object being to add more furnaces later. The blower plant has two No. 8½ Root blowers and one No. 7½ Connersville type, all geared to 150-hp. slow-speed G. E. induction motors. The ordinary pressure at the tuyeres is 11 oz., with 16 oz. at the blowers. With very fine charges the pressure rises to 15 oz. at the tuyeres, with a corresponding increase at the blowers. Each furnace uses 12,500 cu. ft. of free air per minute, practically 100,000 cu. ft. per ton of charge. This high consumption of air is required to maintain a sufficiently oxidizing condition in the furnace. The blast is passed through McDonald hot-blast stoves, where it receives a superheat of 70 to 80° F. before entering the furnace. The loss in pressure between the blowers and the furnaces is chiefly due to the friction loss in passing through the stoves.

The stoves also serve the purpose of dust-chambers. Downtakes lead directly from the top of the furnaces to the stoves, and the bulk of the flue-dust is deposited in the space underneath the heater-pipes, which space is cleaned out periodically. What dust is not caught here settles on the bottom of the draught-flue that is built up the side of the hill, back of the smelter. The flue is 7 ft. wide and 8 ft. 2 in. to the spring of the arch, with a semi-circular arch, the total length being 1100 ft., and rising 136 ft. above the charging floor. A stack at the top 15 ft. high, makes the total height of the draught column 151 ft., this being ample for the needs of the plant. The large flue-section, 76 sq. ft., permits the gases to travel through slowly and the dust to settle quite completely.

The slag is run into elliptical slag-pots mounted on trucks, holding 16 cu. ft., hauled by mule teams over a surface tram to the slag-dump. The matte-pots, holding 2 cu. ft., are cast of mild steel and mounted on two-wheeled hand-trucks. Cast-iron pots were formerly used, but as they gave a great deal of trouble from cracking, steel pots were tried and found satisfactory during the 9 months they have been in use. All of the fire-brick used for the settlers and furnace-bottoms (excepting around the spouts) are made on the ground from clay mined on the company's property. The brick cost $15 gold per thousand, the clay being ground and the brick molded by hand. Fire-brick imported from the United States cost $95 per thousand at the smelter. The local clay is also used for tap-hole stoppers, and in all work around the furnaces for which fire-clay is required. Slag-brick are also made from the more silicious low-lime slags, and are used for building purposes. They are 8 by 22 by 4 in., cost $5 gold per thousand to make, and produce a very neat and durable building.

The furnaces are usually charged at intervals of 15 min., 4080 lb. of raw ore going in with each charge. The ore is wheeled in two-wheeled buggies from the patio and weighed. Crusts or accretions are barred down from the charging floor in the usual manner. The entire smelter force is Mexican, with the exception of the superintendent, night foreman, and one repair-man. These are from the United States.

The ores are separated into four general classes, based on their composition as affecting smelting operations, namely, oxidized ore (acid), silicious sulphide (acid, or self-fluxing), sulphide (basic), and lime spar (fluxing). They furnish the necessary variety for making up the furnace-charges without any further additions. Each of the above four classes exhibits considerable variation in composition and metal content, but the following may be considered fairly representative:

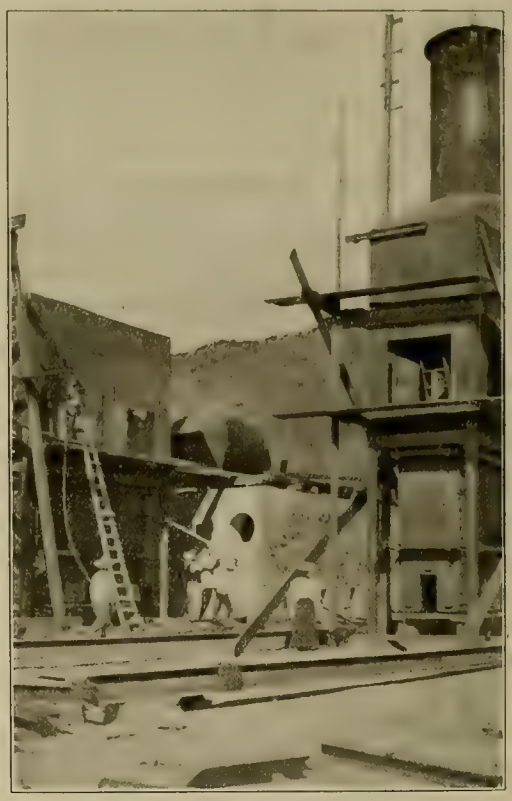
	SiO_2	Fe	MgO	Al_2O_3	S	CaO	Cu	Au
	%	%	%	%	%	%	%	
Oxidized	62	13	3	4	2	2	0.5	$12
Siliceous sulphide	42	26	2	7	19	3	0.9	13
Sulphide	18	40	2	3	35	2	1.1	8
Lime spar	9	5	2	3	2	48	0.2	3

By proper selection of ores, through control of mining operations and bedding of ores in advance of requirements, it is possible to maintain a quite uniform charge. Lack of ore-bin facilities hinders this at present; consequently there is considerable variation in the composition of the charges, and close supervision is required to keep the furnaces up to capacity. A certain amount of low-grade matte is always made, which must be concentrated by re-

Erecting Blast Furnace.

smelting to bring it to shipping grade. It may eventually prove desirable to concentrate the ore prior to smelting, but in present practice the low-grade matte is a useful addition to the charge, and renders available a larger proportion of the acid ores. Any foul slag from the furnaces, all barrings, and the like are added to the charge. Owing to the high gold content of the matte, the waste of any 'metallics' is scrupulously avoided. West Virginia coke is used for fuel in the proportion of 10% of the total charge fed to the furnaces. The shipping matte contains from 15 to 17% copper and $110 to $135 gold per ton. The charge-sheet shown below may be taken as representative of the furnace operations.

The slag-losses calculated back to the original ore-charge amount to 74.6c. gold, and 2.14 lb. copper, per ton of ore. The flue-dust losses amount to 67.5c. gold, and 1.19 lb. copper, per ton of ore charged. The flue-dust is being stocked at present; a briquetting plant will be installed later, and all of the accumulation will then be worked up. The records of four



Partly Completed Furnace.

	Dry	SiO_2		Fe		CaO-MgO		Al_2O_3		S		Cu		Au Value.	
	Tons.	%	Tons.	%	Tons.	%	Tons.	%	Tons.	%	Tons.	%	Lb.	Per T.	Total.
Oxidized	113	62	70.0	13	14.7	5	5.7	4	4.5	2	2.3	0.5	1,130	$12.00	$ 1,356
Siliceous sulphide	697	42	292.8	26	181.2	5	34.9	7	48.8	19	132.4	0.9	12,546	13.00	9,061
Sulphide	109	18	19.6	40	43.6	4	4.4	3	3.3	35	38.2	1.1	2,398	8.00	872
Lime spar	81	9	7.3	5	4.0	50	40.5	3	2.4	2	1.6	0.2	324	3.00	243
Total raw charge.	1,000	..	389.7	..	243.5	..	85.6	..	59.0	..	174.5	..	16,398	.....	11,532
Conc'ting matte..	30	..	....	59	17.7	..	...	..	....	32	9.6	9.0	5,400	48.00	1,440
Coke	115	6	6.9	2	2.3	..	...	2	2.3	..	....	..	.....	.....	.....
Total charge	1,145	..	396.6	..	263.5	..	85.6	..	61.3	..	184.1	..	21,798	.....	12,972
Slag	825.4	..	386.6	..	221.2	..	83.2	..	53.2	..	17.0	..	2,143	.....	746
Matte	62	..	....	..	35.3	..	...	..	....	..	17.3	..	18,465	.....	11,551
Flue dust	30	..	10.0	..	7.0	..	2.4	..	8.1	..	1.8	..	1,190	.....	675

Slag composition:	%
SiO_2	46.9
FeO	34.4
CaOMgO	10.1
Al_2O_3	6.4
S	2.1
Cu	0.13

Gold per ton, $0.88.

Matte composition:

Fe,	57.1
Cu,	15.0
S,	27.9

Gold per ton, $186.30.

Sulphur volatilized, 148 tons, equal to 85%.
Weight of slag, 71% of total charge.
Matte-fall, 5.4%.
Concentration, 16 of ore into 1 of 15% matte.

months' operations show a total furnace loss, calculated from the difference in total value between the furnace charges as shown by assay and the settlement value of the matte, of $1.06 gold, and 2.16 lb. copper, per ton of ore smelted, being somewhat less than the loss shown above. For the same period the recovery of copper was 83.3%, and of gold 87.4%. A portion of this time the furnaces were hampered by insufficient blast, by reason of an accident to the main blast-pipe. The normal recovery is probably more nearly represented by the figures on the charge-sheet, which show a recovery of 89% of the gold and 84.7% of the copper.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination.

C. W. A., Le Grand, California: Iron pyrite.

G. A. D., Nelson, Nevada: Weathered diorite porphyrite.

R. A. S., Rico, Colorado: Rusty quartz, garnet, epidote aggregate.

W. S. G. T., Santa Cruz, California: Pyrite and epidote in silicified shale.

H. A. J., Elizabethtown, New Mexico: Feldspathic sandstone with calcareous cement.

C. E. H., Lewis, California: Mica schist, slightly talcose and containing a little calcium carbonate.

J. W. McC., Clairville, California: Epidote in a metamorphic acid, or medium acid, lava (perhaps acid andesite), now properly a schist.

A. B. W., Ely, Nevada: Nondescript mixture of kaolin, quartz, manganese oxide, and calcite, probably a much weathered acid lava or tuff.

R. M., Kimberley, Nevada: No. 1, friable acid volcanic rock, probably altered tuff or breccia, with pyrite and chalcopyrite—has the feel of volcanic ash; No. 2, altered and silicified volcanic, probably andesite, with pyrite, chalcopyrite, hematite, and calcite; No. 3, silicified breccia, with pyrite, limonite, and manganese oxide. No. 4, silicious rock, with pyrite, limonite, manganese oxide, and minute quantities of azurite; No. 5, nondescript quartz-limonite aggregate.

R. McM., Bouse, Arizona: All specimens uniformly too small for satisfactory examination; No. 1, arkose; No. 2, granite, possibly arkose; No. 3, quartz-amphibole schist; No. 4, micaceous sandstone; No. 5, possibly complex micaceous sandstone, probably silicified trap; No. 6, a chlorite-kaolin aggregate with minute particles of specular hematite; No. 7, micaceous sandstone with oxides of iron and copper silicate; No. 8, acid volcanic breccia with minute specular hematite; No. 9, altered andesitic lava; No. 10, altered andesite, with scales of hematite; No. 11, nondescript quartz-feldspar rock (probably detrital), impregnated with limonite and hematite; No. 12, weathered felsitic rock.

ELECTRIC SMELTING OF IRON ORE.

By C. E. Elwell.

*The seventh run of the single-phase experimental electric furnace of the Noble Electric Steel Co., at Heroult, Shasta county, has just been completed. The furnace was run from 7 a. m., August 25, until 7 p. m., October 3, a period of 39 days, and was shut down while running at its best, in order to obtain data relating to the exact distribution of the charge when the furnace is running normally. In this period a total of 35 tons of pig-iron was produced, with an energy expenditure of 11.34 kilowatt-years, or an average of 0.324 kw.-yr. per ton of pig-iron produced.

The run may be properly divided into two parts. For the first 25 days the 160-kw. transformer was used, and 14 tons of iron were produced, with an expenditure of 6.09 kw.-yr., or an average of 0.435 kw.-yr. per ton. It appeared that this was too little power for the furnace, and so a 500-kw. transformer delivering current at a pressure of 50 volts, was connected to the furnace. This allowed the furnace to take all the energy which it required at this voltage, and it promptly took about 200 kw. It was not found to be so advantageous to have a fixed voltage as to have a variable, as it was difficult at times to get the furnace to take its full quota of energy, for example, after tapping. In spite of this, in the 14 days of the period the furnace made 21 tons, with an expenditure of 5.35 kw.-yr., or an average of 0.250 kw.-yr. per ton. The furnace was then shut down, as before noted. The summary for the last seven days of the run shows that an average of nearly 1½ tons of iron was produced per diem, at a cost of 0.273 kw.-yr. per ton, or $4.20 per ton for electric energy. If this figure can be obtained with such a small furnace as one of 200-kw. nominal rating (the average load was 154 kw.), in which quite a percentage is given up in losses, then the prospects for the realization of a better figure with a larger furnace are indeed bright.

The figure for the whole run, from the time current was switched on until it was switched off, was 0.324 kw.-yr. per ton, or $5.18 per ton for electrical energy. The legitimate figure to take, however, is the one for the second period, where 21 tons were produced at an average expenditure of 0.25 kw.-yr. per ton, or $4 per ton for electrical energy.

The Noble Electric Steel Co. is now building a 1500-kw. furnace, which, on the basis of the above results, ought to have no difficulty in producing 15 tons per diem as a minimum, and 20 tons ought not to be out of the way. Taking into consideration the low cost of furnace, labor, and electrical energy, there seems to be no reason why iron cannot be made at the plant for $16 per ton, a conservative estimate. The problem has not been one of making pig-iron so much as to build a furnace which would stand the excessive internal heat. After a run of 39 days it seems as if this is also solved.

The iron ore for smelting is being furnished by the Shasta Iron Co., from a mine on the Pit river. The ore is magnetite, carrying from 50 to 75% iron.

*Abstracted from *Journal of Electricity, Power, and Gas.*

CALUMET & HECLA COSTS.—I.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

The Calumet & Hecla company has divulged so little information regarding its operations that the following, taken from testimony given in a suit brought by A. S. Bigelow against the Calumet & Hecla Mining Co., before Judge Knappen of the U. S. Circuit Court for the Western District of Michigan in the year 1907, is of unusual interest and value.

Complaint was made by Mr. Bigelow, a holder of 1000 shares of Osceola stock, that the Calumet & Hecla Mining Co., having acquired 20,000 shares of such stock, was about to get control of the Osceola Mining Co. to monopolize the output of "prime Lake Copper, which he stated was used by the U. S. Government and others to the exclusion of electrolytic copper."

The copper production of the world in 1906 is given at 1600 million pounds, of which the Americas (North and South) produced 1400 millions, and the United States 914 million pounds, 60 to 70% being electrolytic. From one fourth to one fifth of this, or 226,700,000 lb., is produced by the northern peninsula of Michigan, and of that quantity, only 167 million pounds could be called Lake copper, as quoted at New York. This was credited to various mines, as follows:

	Lb.
Calumet & Hecla	100,000,000
Osceola Consolidated	18,000,000
Tamarack	10,000,000
Quincy	18,000,000
Wolverine	10,000,000
Franklin	4,500,000
Michigan	2,000,000
Mass Consolidated	2,000,000
Adventure	2,000,000
Victoria	850,000
	167,350,000

Thus two-thirds of the copper is produced by the Calumet & Hecla alone.

The present value of the Calumet & Hecla property is given at $90,000,000. It consists of the Calumet and the Hecla mines, and a portion of the Osceola lode extending for a distance of 2½ miles, yielding a conglomerate ore and an amygdaloid ore, respectively. The company is interested in other mining properties, a railroad, by which the ore is delivered to its concentrating mill on Torch lake, a stamp-mill at Lake Linden, 5½ miles distant, and a smelting plant a mile beyond, at Hubbell. Besides this, it owns a smelter and an electrolytic refinery at Buffalo, N. Y. It has acquired 50,000 acres of woodland, in addition to mineral lands covering 2680 acres. The Osceola amygdaloid lode of the C. & H., adjoining the Osceola property, consists of 640 acres. The total lands owned by the C. & H. aggregate 65,650.37 acres.

The equipment, consisting of the mine plant, the railroad, the mill, and the smelters, may be reckoned at 15 to 16 million dollars, and there are 4500 men employed. The machinery, worth ten million dollars, if the mines were exhausted, would be worth 25% only of its present value. The railroad has cost $500,000, and, if it were sold to be removed, might bring 15 to 20% of its present valuation.

In 1873 the company put out 200,000 tons of ore carrying 5% copper, while in 1906 the ore contained a little over 2%, the richness decreasing as the mine became deeper. On the dip of the lode a distance of 8100 ft. has been reached, equal to a vertical depth of 5000 ft. It is estimated that at the present rate of extraction the C. & H. conglomerate lode will be exhausted in 10 to 15 years.

The capacity of the mines may be given at 6000 tons of conglomerate and 2000 tons of amygdaloid ore per day. The mill works 80 to 82% of its actual capacity, and the smelter 60 to 70%. On the Osceola lode, hoisting is only done to the extent of 20% of the capacity, or to the amount of 2000 tons daily. This Osceola lode has only been producing the last four years, and has yielded 20 to 25 million tons of rock, and is now yielding at the rate of 9 to 10 million pounds of copper yearly, but this has not offset the decrease in the yield from conglomerate.

Until 1904 the company mined only the conglomerate lode, one tenth of the output being broken from the Kearsarge and Osceola lodes. Where worked by the company, one third only of the Osceola lode is said to be profitable, and on the Kearsarge no profitable mining has been done. On this latter lode pay-ore runs 17 to 18 lb. per ton. With the increase in depth, and as it proceeded northward the conglomerate has been found to increase in arsenic content.

One billion feet of timber has been put into the workings on the conglomerate lode, that is, the original C. & H. Thirty million feet, board-measure, is being buried annually. This calls for the yield of 1000 to 1500 acres of wood-land, only the larger trees being suited for mine timbers. The amygdaloid lode, on the contrary, needs but little timber—not more than 5% of the conglomerate.

Costs per ton on the amygdaloid Osceola lode for the year ending April 30, 1906, are given as follows:

Timbering	$0.0471	
Openings (drilling and sinking shafts)	0.0819	
Driving and stoping	0.8844	
Repairing shafts	0.0030	
Mining		$0.9693
Hoisting	0.1010	
Shaft-houses	0.1336	
Transport to mill	0.0844	
Milling	0.2631	
Miscellaneous	0.0180	
Haulage and milling		0.6001
Total cost		$1.5694

This total includes general expense, but not taxes.

The company has two adjoining mills, one treating 6000 tons of conglomerate ore daily; the other, 2000 tons of amygdaloid ore.

The loss in copper in treating the amygdaloid was 3.3 lb. out of 24.57 lb. copper per ton, or a loss of 13.4%. In the following year the loss was 3.66 lb. per ton, or 15%, on the same basis.

The product of the mill was divided into:

Barrel work, or pieces not entering the stamp batteries at all, and which had been first picked out.

No. 1, a size taken from under the stamps, and nearly pure copper.

No. 2, the finest size, containing 20 to 24% copper.

The milling cost in 1906 for amygdaloid ore, broken from the Kearsarge and Osceola lodes, was given at 26.31 cents per ton. This figure seems high when compared to that given by the Osceola company, treating the same ore, namely, 16.7c. per ton.

The concentrate from the various mines in the Lake Superior copper region is melted and refined to produce commercial copper, and this product, the result of the first melting, was found to vary in conductivity for the different mines as follows, based on the Mathiessen standard annealed wire:

Mine.	%
Wolverine	91 to 92.5
Centennial	92
Calumet & Hecla (conglomerate)	99.5
Calumet & Hecla (amygdaloid)	101
Tamarack	96
Osceola	101
Franklin	100
Quincy	101
Adventure	101
Mass	101
Michigan	100 to 101
Victoria	93 to 94.5
Osceola (Kearsarge amygdaloid)	91
Mohawk	77.5 to 81
Atlantic	100
Copper Range	65 to 45
Isle Royale	50 to 55

When copper is of 90% conductivity it will carry no more than 0.04% arsenic, and when the conductivity is as high as 101, the content in arsenic has dropped to 0.0004%. It appears that traces of arsenic do not interfere with the ductility of copper when used for boiler plates or cartridge cases, though it diminishes the conductivity. Oxygen, which existed as sub-oxide of copper in the best Lake copper ten years ago to the extent of 0.10 or 0.12%, is now as low as 0.05 to 0.10%. This would correspond to 0.45 to 0.90% sub-oxide. The American Brass Co. calls for copper of 95% conductivity for casting purposes, and of 99.5% for wire for electrical purposes.

The capacity of the smelting works at Hubbell is 10 million pounds of refined copper per month of 25 days, allowing for the necessary delays incident to the repairing of the furnaces. In 1906 it was worked to 60% capacity.

With reference to the smelting of the mill-products, the 'barrel work' or lump copper, the No. 0, and the No. 1 copper were sufficiently high-grade to be directly melted, the slag removed, and the copper rabbled or poled to produce a refined article of 99.5 to 101% conductivity. The No. 2 'mineral', containing approximately 20% copper, would, upon melting in a reverberatory furnace, yield a small amount of copper, but chiefly slag containing copper. This slag would be broken up and sent to the blast-furnace, there giving a poor slag, say, 1% copper, and 'cupola blocks', a 95% product. This is properly subject to a melt in a reverberatory furnace, where it is rabbled and poled; since it contains 10 to 14 oz. silver, as well as a little arsenic, it is cast into anodes, which are shipped to the Buffalo works of the company for electrolytic treatment. These anodes have a conductivity of 92 to 95%. In all cases the rabbling was carried to the point where the test-button gave a depressed centre, after which poling proceeded until the button showed itself flat on top and, when carefully fractured, a fibrous structure.

According to W. H. Bassett of the American Brass Co., which is one of the largest users of copper in the United States, tests on 55 samples of Lake copper for tensile strength gave 66,141 lb. per sq. in., and a conductivity of 99.85%. Tests on electrolytic copper made on 511 samples on a wire of 0.03 in. diam. for tensile strength, gave 65,259 lb. per sq. in., and for conductivity 100.32%. Tests for ductility showed an elongation of 1.45% for Lake and of 1.55% for electrolytic copper. Finally, on a wire of 0.80 in. diam. it was possible to give the Lake copper 22.2 twists in a length of six inches, while electrolytic withstood 24.8 twists in that length without breaking.

The Skyscraper an American Type.—Whether the American city has been justified in permitting the skyscraper to flourish, or whether the American investor in the end will find the lofty tower and the huge office building a useful and profitable investment, time only can tell; but that the American architect and engineer have been able to meet the opportunity which has given rise to these structures admits of no discussion. Not only has a type of building based on pure utility and special conditions been evolved, but an artistic design and treatment has resulted that today justly earns the admiration of European critics. And in actual construction no less than in design have American ingenuity and engineering skill been manifest. Structural materials—especially steel, terra cotta, and concrete—have been improved, and their use has been developed along scientific lines, so that the construction of a modern skeleton building, with due regard to all elements of safety, can be carried on with a skill and certainty not excelled in any form of structural engineering. And with the experience of large fires and an earthquake to test his work, the engineer of the modern skyscraper surely can say that he, like his building, stands on a firm and safe foundation.—H. T. WADE, in *Review of Reviews.*

A stream of lava from the volcano Kilauea on June 3, 1840, flowed 11 miles over the island of Hawaii to the sea. "The burning lava, on meeting the waters, was shivered like melted glass into millions of particles, which were thrown up in clouds that darkened the sky and fell like a storm of hail over the surrounding country."

The Rhodesian mineral output for the month of August amounted to £234,543, which is a decrease, compared with the figures of the previous month, to the extent of £7359, though an increase of £23,801 when compared with the corresponding month of last year.

THE RED RIVER, CORNWALL.

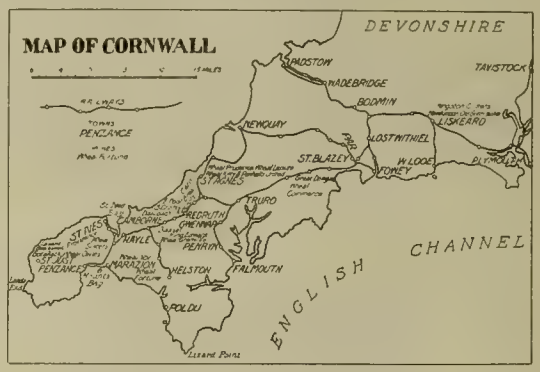
Written for the MINING AND SCIENTIFIC PRESS
By EDWARD WALKER.

The condition of the Red river in Cornwall is giving the community a good deal of anxiety at the present time. The bed of the river is becoming so silted with tailing that an extra rainfall causes disastrous floods. The Red river is what an American would call an 'institution', and those who are acquainted with the history of mining are familiar with the question involved. As there must be many of your readers who have only a hazy idea of the problem, the present opportunity seems a good one for recapitulating the facts.

The Red river is a small stream flowing from the high grounds behind Camborne to the sea at Gwithian in St. Ives bay. It is only about 12 miles long, and if its natural current were not supplemented by mine waters it would be nothing more than a tiny rivulet. As it is, the waters from the five largest mines in Cornwall, namely, Dolcoath, Grenville, South Crofty, East Pool, and Carn Brea & Tincroft run into it. I would add in parenthesis that these waters, which are charged with oxidized pyrite, give the river its name. The amount of water passed into it from these sources is not so very great, for the amount of pumping required at these mines is not more than is necessitated by surface requirements at the dressing-works and power-houses. The first four mines mentioned all discharge their tailings into the river. Carn Brea & Tincroft discharges some of its tailing in this way, but owing to the shortness of water is obliged to stack a good deal of the sand. One of the other mines near-by—the Basset, has to cope with more water, and unfortunately its discharge does not go into the Red river but into another watercourse; otherwise the congestion of tailing would not have become so serious.

I estimate that about 300,000 tons of tailing is discharged into the Red river every year from the mines in question. It is no wonder that the course of the river, even if the flow were uninterrupted, should get silted to some extent. It is probable that the bed is now 10 or 12 ft. higher than it was 40 years ago. The course, however, is not uninterrupted, for 10 miles of its length is occupied with one stream-works after another, at which the tin remaining in the tailing is recovered by means of cheap automatic machinery. The average contents of the 300,000 tons treated at the mines is probably about 40 lb. of tin oxide per ton, and the extraction at the mines is not more than 75%. It is difficult to give the exact content, as no accurate records are kept. The assay of tin ore is a tedious one, and the Cornish managers have never considered it worth the expense systematically to sample the feed and the tailing, contenting themselves with estimating the recoverable tin by means of the vanning shovel. It seems an alarming statement, but I believe that quite 1000 tons of tin oxide goes in the tailing from these mines into the Red river. The mines treat the ore very completely on all sorts of ancient and modern plant, buddles, rag frames, Frue vanners, Wilfleys, Buss tables, etc., and when they are quite done with the ore, the stream-works in the Red river re-grind the sand and pass the richer part of the tailing, which has been concentrated in settling-tanks, over rag frames time after time. The rag frame is a sort of inclined-plane buddle, off which the adhering particles are washed every five minutes or so by an automatic discharge of a stronger current of water. After this continuous washing, there still remains tin oxide in the tailing, and on the beach at Gwithian there is a fringe of concentrate always worth collecting.

The question arises: How is it that the recovery of tin oxide is so imperfect? For one thing, the grade of the ore is so low that the small proportion of tin oxide is apt to be swept along by the greatly preponderating quantity of gangue. Taking 40 lb. as the contents of the ore, this is only 2% of tin oxide. A second reason is to be found in the physical characteristics of tin oxide. Though much heavier than the gangue, it is so 'slippery' that it does not readily adhere to the surfaces of the concentrators. It has no metallic lustre and is easily



wet. The tin oxide is finely disseminated in the ores and crushing to 30 mesh is necessary, and the pulp is in the form of fine sand and slime. The fine tin oxide does not float away like friable pyrite, but is not easily brought into contact with the tables.

Every time the tailing is sent over a rag frame, a very small proportion is caught, perhaps not 5% of the contents. This explains how it is that one stream-tin works after another can make operations pay. The question may be asked, Why do not the mines or upper stream-works pass the tailing over rag frames more than once? The answer is that they have no further surface space at their disposal, and that there is no alternative but to spread the continual dressing operations right down the length of the river.

As I have remarked already, the present situation on the Red river is giving trouble owing to the filling of the bed. The danger comes when there is a sudden rainfall after a drought. As a rule the amount of water other than that discharged by the mines is not great. When severe rains come, the river is filled rapidly and it overflows its banks, causing great inconvenience to the agricultural interests. The landowners and the public authorities are giving the matter their attention.

COMPANY REPORTS.

SIMMER & JACK.

This is one of the mines, and the largest, controlled by the Consolidated Gold Fields of South Africa. The Simmer & Jack is, however, operated by a subsidiary company named the Simmer and Jack Proprietary Mines, Ltd., having a capital of £3,000,000. The report for the fiscal year ending June 30, 1908, states that the mill of 320 stamps crushed 785,310 tons, showing an average duty of 7 tons per stamp. The yield was augmented from several sources, thus:

Source.	Tons.	Oz.	Value.	Dwt. per ton.
Battery	785,310	165,526	£696,524	4.2
Tube-mills	332,053	43,939	184,893	1.1
Sand	547,737	75,437	317,260	1.9
Slime	237,573	16,343	68,734	0.4

Thus it is seen that 785,310 tons of material were treated, yielding £1,267,411, or 7.67 dwt. per ton. The total operating expenditure was £636,907, or 16s. 2.6d. per ton crushed. The working profits were £631,918 and the net balance to revenue was £601,067 15s. 4d. Dividends aggregating £600,000 were paid, leaving a balance on hand of £197,047, as compared to a previous balance of £243,389. The ore reserves are estimated at 1,902,000 tons, averaging 7.6 dwt. per ton. In addition, 134,900 tons are partly developed. During the year 933,441 tons were hoisted, of which 146,456, or 15.69% was separated, by sorting, before milling. During the year some 4000 Chinese laborers were replaced by African natives, and this entailed a heavy expenditure. It is believed that the example of efficiency set by the Chinese, now being repatriated, has had an excellent effect on the Kaffirs. The consulting engineer is H. H. Webb, the general manager is C. D. Leslie, and the superintending engineer is Leslie Simson.

The Consolidated Gold Fields of South Africa report for the year ending June 30, 1908, shows that the profit won from subsidiary companies was £662,799, on a capital of £2,000,000 in ordinary shares and £1,250,000 in preference shares. Of the profit, £468,260 is available for dividend.

GLOBE & PHOENIX, RHODESIA.

The directors of the Globe & Phoenix Gold Mining Co., in their interim report for the half-year ended June 30, 1908, show a material improvement in tonnage and value of ore as compared with the end of 1907, the respective figures for ore reserves being 107,309, against 122,408 tons, worth £250,137 and £315,919. On July 8 last an interim dividend of one shilling per share was paid, and the board has now declared a second interim dividend of one shilling per share, free of income tax, payable on October 8.

H. A. Piper, one of the consulting engineers of the company, stated that development was confined to the Phoenix mine, the Globe mine being now completely closed down and worked out. The advance for the half-year amounted to 3621 ft., as follows: permanent work 44 ft., development work 3532 ft., dead work 45 ft.; bringing the total footage in the mines to 37,386 ft. The main shaft had reached a depth of 2161 ft. The vein at the bottom averaged 22.1 dwt. over a width of 31.3 in. The grade of the ore has materially improved in depth, the increase from the fourteenth level downward being most marked. The antimony present will continue to decrease the extraction until the sorting plant, expected to be running before the end of the year, is working; meantime the only serious loss is in the sand-plant, but the sand tailing is being accumulated for future treatment. The slime extraction is good. At present the slime is being stored and allowed to oxidize. The accumulated slime only has been traced. Although this meant rehandling, the extra cost is more than compensated for by the improved extraction. Details of the different departments Mr. Piper gives as follows:

MILL.

Forty stamps, 169 days 23 hr. 50 min.
Ore crushed, 37,546 tons.
Duty per stamp per diem, 5.52 tons.
Extraction per ton in fine gold, 8.34 dwt.
Average tailing assay, 3.92 dwt.
Profit on milling, £21,540 17s. 2d.

CYANIDE PLANT.

Sand treated, 25,644 tons.
Yield in fine gold, 2225.07 oz.
Assay value of charges, 4.12 dwt.
Assay value of residue, 2.20 dwt.
Actual extraction, 42.12%.
Cyanide consumption, 0.86 lb. per ton.
Zinc consumption, 0.17 lb. per ton.
Sulphuric acid consumption, 0.21 lb. per ton.
Cost per ton treated, 3s. 2.19d.
Profit for six months, £5269 6s. 4d.

SLIME PLANT.

Accumulated slime treated, 7178 tons.
Current slime treated, 3877 tons.
Yield in fine gold, 973.05 oz.
Cyanide consumption per ton, 0.68 lb.
Zinc consumption per ton, 0.22 lb.
Sulphuric acid consumption per ton, 0.19 lb.
Profit for six months, £1665 5s. 7d.

Concluding, Mr. Piper says that "the increase in ore reserves and values is encouraging, and is due entirely to the enrichment in the deeper levels; indications point to the fact that the vein is narrower with depth, which, taken in conjunction with the contemplated increase in sorting, will necessitate more active development than hitherto, especially now that the Globe mine is closed; the gold extraction and milling grade should, however, improve. I would emphasize the fact that at the depth at which the mine is working, namely, 2300 ft., it is one of the deep quartz mines of the world; and the continued reduction in working costs under these conditions should be considered satisfactory."

The figures were striking, in view of the outcry raised in some quarters against the Government's action in ordering an improved scale of diet during the latter portion of 1907.

The details of costs per ton were as follows, on a total of 37,546 tons:

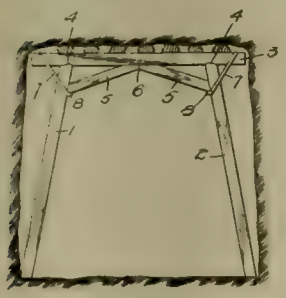
	£	s.	d.
Mining	0	7	2.22
Milling (including maintenance).....	0	5	1.93
Hauling and pumping maintenance....	0	2	7.11
Transport and rock-breaking maintenance	0	1	2.27
General maintenance	0	0	2.72
Battery engine and boiler maintenance	0	0	6.16
Workshops	0	0	4.05
Administrative charges	0	1	11.75
Gold realization	0	0	3.36
	£0	19	5.57
Mine development redemption	0	4	0.00
	£1	3	5.57
Cyanide per ton milled (including maintenance)	0	2	2.05
Slime (including maintenance).....	0	1	3.36
	£1	6	10.98

The cost per ton of sand treated was 3s. 2.19d., as against 3s. 2.39d. last year. The cost per ton of slime treated was 4s. 4.14d. Waste sorted out, 2456 tons, having an average value of 0.78 dwt. The gross value of the ore treated was £2 2s. 1d., this, therefore, leaving a profit of 15s. 2.02d. per ton, or an aggregate of £28,475 9s. 1d., excluding depreciation, London office expenses, and all other charges. Since the commencement of milling operations the mines have produced £1,391,650, from which has been obtained a net profit of £591,019.

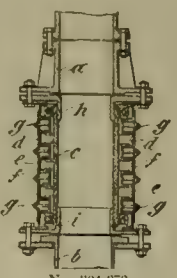
MINING AND METALLURGICAL PATENTS.

Specially reported for the MINING AND SCIENTIFIC PRESS.

MINE-ROOF SUPPORT.—Frederick C. Keighley, Uniontown, Pennsylvania.



No. 904,878.



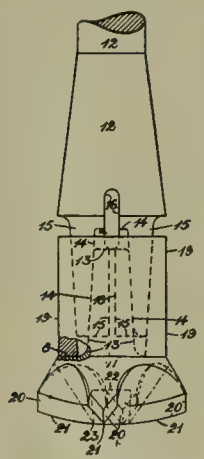
No. 904,870.

A device of the class described, comprising a pair of standards, a horizontal member, having notches engaged by said standards, said standards being inclined inwardly, inclined braces extending from the upper part of said standards to a point near the centre of said horizontal member, stirrups adapted to encircle the upper portions of said standards and the ends of the horizontal member, said stirrups being formed with projections at their lower ends, said projections being adapted to support the inclined braces at the point where they meet the standards.

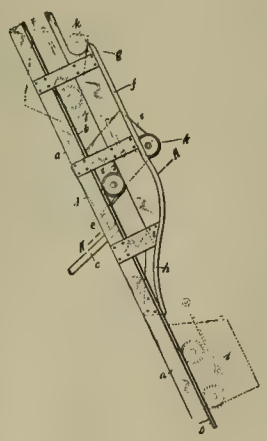
PUMP FOR MINE-SHAFTS.—No. 904,870. Richard Heidecke and Otto Lellau, Neuhof, near Fulda, Germany.

A pump for sinking mine shafts, comprising in combination with the pump and its suction pipe, a flexible armored connection between both consisting of a flexible tube, flanges at both ends of said tube to connect the latter to said pump and suction pipe respectively, a series of divided U-rings disposed so as to surround said tube and to have their webs alternately placed outward and inward, and stays to rigidly connect said rings, for the purpose set forth.

ROCK-DRILL.—No. 903,936. John R. Wilson and Frederick R. Thackrath, Benoni, Transvaal.



No. 903,936.



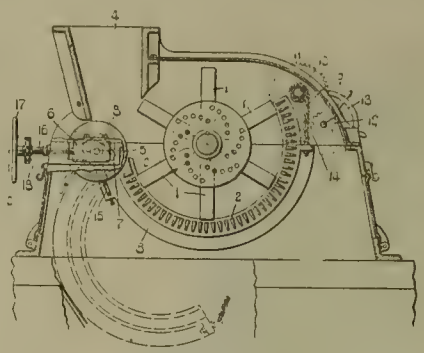
No. 902, 263.

A rock-drill of the nature specified comprising in combination a holder and a detachable bit having a plurality of substantially tangential cutting edges and a circular cutting edge at the centre, and means for detachably securing the bit to the holder.

SKIP-DUMP.—No. 903,263. John Angove, Calumet, Michigan.

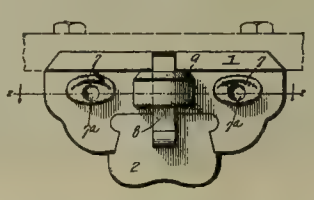
In an apparatus of the class described, the combination of a pair of main rails; a pair of dump-tracks which extend alongside said rails and are provided at one end with switch-pieces that extend toward said rails, the latter continuing beyond said switch-pieces in both directions substantially parallel to said dump-tracks; and a skip-car provided with two pairs of wheels, the tread of one of said pairs of wheels being greater than the tread of the other of said pairs and the interval between said switch-pieces being greater than the interval between said main rails; whereby the wheels of narrow tread continue on said main rails past said switch-pieces and between said rails and dump-tracks, while the wheels of wide tread engage said switch-pieces and ride along the outside of said dump-tracks.

CRUSHER AND PULVERIZER.—No. 904,909. Milton F. Williams, St. Louis, Missouri.



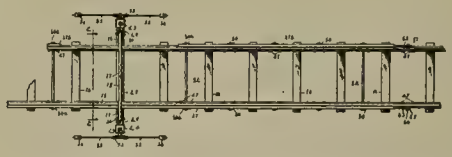
A crusher or pulverizer provided with beaters or hammers, a pivotally mounted grinding surface and a rotatable breaker plate, and means for simultaneously adjusting said grinding surface and rotatable breaker plate relatively to the hammers; substantially as described.

MINE-CAR PEDESTAL.—No. 905,000. John R. Roberts, Wilkes-Barre, Pennsylvania.



In a device of the kind described a pedestal, a sliding oil cup carried by said pedestal, said cup having a bearing for an axle, and bosses formed on a side of the pedestal and upon opposite sides of the oil cup, said pedestal having reservoirs formed therein and being provided with passages leading through said bosses to said reservoirs and from said reservoirs to opposite sides of the oil cup, respectively, the bosses overhanging the entrance to the passages leading through them.

MINE-DOOR.—No. 903,846. Joseph L. Dinwiddie and Albert F. Braun, Carlinville, Illinois.

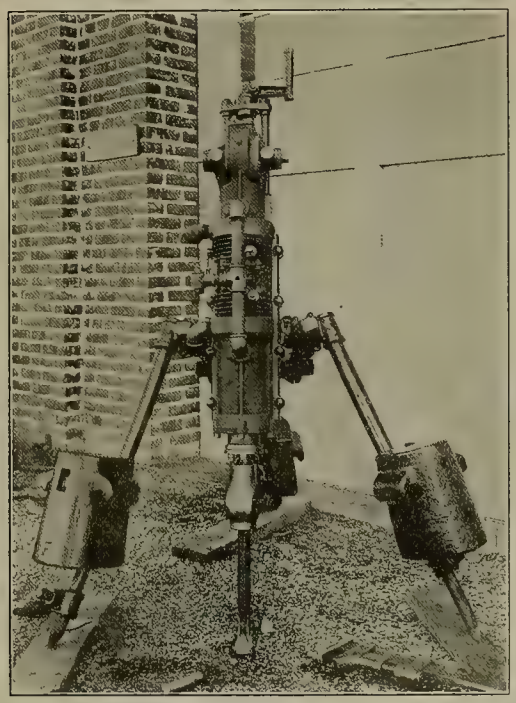


In an apparatus for the purpose stated the combination with a hinged door and a railway track, of a door operating member arranged adjacent to one of the rails of said track and having its upper edge normally above said track rail, said member being provided with a series of graduated slots, a trip, a trip bar, said bar having a series of graduated slots, rock-arms supporting said member and trip bar and engaging said slots, operative means for said door, and connection between said member and said door operative means.

Gasoline Rock-Drill.

A gasoline rock-drill has been invented and built by L. L. Scott, a manufacturer of gas engines, at Joplin, Mo. The double-acting piston type is illustrated in this article. The engines on all of these drills work on the two-cycle principle.

From experience, the requirements for a practical piston gasoline rock-drill were found to be as follows: Must receive an impulse on every up and down stroke. A powerful up-stroke is required for drilling deep down holes from 10 to 30 ft. deep, as there is a great weight in the steel to lift, also a tendency for the steel to hang in the hole. Working parts must be entirely enclosed and water-tight. Must be light enough so that two men can handle same. Piston must be a solid piece of steel and yieldingly connected to a



crank-shaft (free piston impossible). Must be free from all valves, gears, push-rods, cams, and other delicate parts that would not stand up under the hard usage to which it is inevitably subjected.

The drill illustrated was built with these points in view. It is compact and weighs 174 lb. It will drill three inches per minute in hard granite and will consume ⅛ gal. gasoline in 15 min. if doing hard drilling. This type of drill is adapted for holes from 10 to 30 ft. deep, while the small hammer type will drill shallow holes equally as fast with half the amount of gasoline.

Briefly, the drill is a unique type of double-acting, two-cycle gas engine. The charges are drawn in at the upper and lower ends of the drill through ports, are compressed and passed to the central part of the drill, where they are exploded alternately (one for the up and the other for the down stroke), and act on the inner faces of the piston. The drill-rod has a swivel connection with the piston and is free to rotate independent of the piston. The rotating device is placed in the lower charge receiving chamber. The crank-shaft is cushioned so that there is no jar on the bearings when the bit strikes the rock. The pistons are acted on by 300 lb. explosive pressure, and are practically free from the crank-shaft when the bit strikes the rock. This gives the result of a free piston, at the same time the crank acts as a guide to insure the proper port opening, keeps the piston from knocking out a head if a pocket is struck in the rock, and is a means of starting the drill. The piston has the usual U bolt-chuck for holding the steel. All parts are oiled automatically by oil that is mixed with the gasoline and drawn in with each suction of the engine. The drill as a whole permits a rigid construction and is a model of simplicity. Common rock-drill mountings are used to support the drill, in connection with the usual feed-screw.

Where the drill is used underground the exhaust is either carried through a steam-hose to a waste-pipe leading to the mouth of the shaft or tunnel, or is run through a special valve into a chemical solution and absorbed thereby. The constant suction of the intake of the engine draws air to the place where the drill is operating and is a means of furnishing ventilation.

Publications Received.

Any of the books reviewed or mentioned in these columns are for sale or procurable from the MINING AND SCIENTIFIC PRESS.

A MANUAL OF UNDERGROUND SURVEYING. By Loyal Wingate Trumbull. 8vo., pp. 250. Hill Publishing Co. 1908. Price $3.

The author frankly states that the information is compiled from various publications, and the practice of the best engineers is fully taken into acocunt. The book describes many 'short cuts' and 'kinks' used in underground surveying, originating through the experience of practical men. The chapter on map making is good, and the entire volume contains much matter valuable for the experienced surveyor as well as the beginner. The methods described are essentially American.

ELECTRO-METALLURGY. By John B. C. Kershaw. 8vo., 300 pp., Ill. D. Van Nostrand Co. New York. Price $2.

This is a compact account of the industrial development of electro-metallurgy, prepared by a recognized authority and written in language that everybody can understand. Any technical terms used by the author are explained in a glossary at the end of the volume. We can commend this book as useful and trustworthy.

EPITOME OF THE ECONOMIC GEOLOGY OF NEW MEXICO. By Fayette A. Jones. Published by the authority of the New Mexico Bureau of Immigration, Albuquerque, New Mexico.

COAL. Bulletin No. 9 of the Fourth Series of the Geological Survey of Ohio. Geology by J. A. Bownocker. Chemistry by N. W. Lord and E. E. Somermeier.

PRELIMINARY REPORT ON THE COALINGA OIL DISTRICT, CALIFORNIA. By Ralph Arnold and Robert Anderson. Bulletin 357, U. S. Geological Survey.

SOME ECONOMIC GEOLOGY OF MONTANA. By J. P. Rowe. Bulletin No. 50 of the University of Montana.

FRANKLIN FURNACE FOLIO, New Jersey. Folio No. 161 of the U. S. Geological Survey.

Catalogues Received.

The AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, has recently issued a catalogue of its extensive line of valves.

THE HOLT MFG. CO., Stockton, California, has recently issued its Bulletin No. T. E. 32, describing the Holt caterpillar gasoline traction engines.

The WESTERN ELECTRIC Co. is distributing a small folder showing views of its cable manufacturing plant. It also sets forth the advantages of cables for telephone service.

The STROMBERG-CARLSON TELEPHONE MFG. Co., Rochester, New York, is distributing several little booklets setting forth the advantages of the key type of intercommunicating telephones.

The HAMMOND IRON WORKS, Warren, Pa., reports a steadily increasing volume of business. The company has recently opened a branch office in Mexico City, which is in charge of Francis E. Pratt.

The WESTINGHOUSE ELECTRIC & MFG. Co. has just issued its 1909 vest pocket diary, which, in addition to the diary feature, contains an immense mass of engineering data, formula, maps, and miscellaneous information.

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EDITORIAL.

NIPISSING is claimed to be producing silver at a cost of 11 cents per ounce, but the president of the Nipissing Mines Company does not hold his operations responsible for the drop in silver. An abnormally small demand for silver in the arts and a slackening of demand from India and China are the principal factors; another is the large proportion of silver produced as a mere incident in the extraction of the baser metals.

SNOWSLIDES usually start in the spring, but occasionally the early snows are piled so as to form avalanches. From Silverton, in Colorado, comes news of several fatalities. This region, known as the San Juan, has long been lamentably celebrated for snowslides, and many is the poor miner that has been suddenly buried in the mountains that look down upon Silverton, Ouray, Rico, and Telluride. The railroads have been blocked by snow and there is promise of a severe winter.

ON another page we publish an abstract from the excellent paper by Mr. Reginald E. Hore on the 'Origin of Cobalt-Silver Ores of Ontario,' with special reference to the district of Cobalt. The revival of interest in this part of Canada seems warranted by the better returns from the mines; and the discovery of new silver-producing areas near Gowganda lake and elsewhere in northern Ontario gives promise of an extension of activity in a part of the world the geology of which presents many remarkable features.

FROM Johannesburg our correspondent sends a particularly interesting letter this week. In the course of it he refers to the failure of the Gordon drill, which has not been able to confirm the excellent results obtained in the stope-drill competition. It is the old story of trials that were not properly indicative, because conditions were not representative. But the effect of the competition in drill-making is excellent, and we shall expect to see the Gordon drill modified to suit working conditions, while other drills also will profit from the records of experience.

THE *Australian Mining Standard*, published by Mr. Critchley Parker, celebrates its 20th anniversary by issuing a number that is especially good, both as to typography and contents. We congratulate out antipodean contemporary. The twenty years of its life cover a stirring period in the history of Australian mining, including the birth and development of the gold mines of Western Australia, the growth of a varied mineral industry in New South Wales, the decadence of Ballarat and Bendigo, the production of copper as well as gold at Mount Morgan, the treatment of the dumps at Broken Hill, the

making of big mines at Mt. Lyell in Tasmania, the Waihi in New Zealand, the Mount Boppy in Queensland. Through all these vicissitudes the *Mining Standard* has held its pennant aloft; we salute!

PHILADELPHIA has long been accepted as typifying what is slow but sure. Apparently the technical societies of that fine city partake the character of their environment. Thus the *Journal of the Franklin Institute* publishes a page recounting the mineral production of the United States in 1906; this will be found in the bulletin of the Institute dated December, 1908. These figures ought to be reliable.

OUR LOCAL contemporaries are now publishing a pseudo-scientific rigmarole concerning the growth of gold. Thus *The Evening Scream* says that "miners on returning to worked-out diggings or abandoned shafts have often discovered rich stores of gold in places where the vein had previously been exhausted." Thereupon *The Morning Howl* quotes "practical miners" living at the nearest hotel, distinguished experts long since extinguished, and professors who profess to be professors, all of whom assert that in some queer alchemic way gold will grow if you give it a chance. This is a good example of newspaper science, like children who have been given some simple lesson in chemistry, they build weird superstructures of supposition worthy of the nursery. Some tired space-writer has been told that gold is precipitated from solution, that it is believed to occur dissolved in underground waters, and that the timbers of old workings have actually been found slightly enriched by gold thus precipitated from solution through the reducing action of organic matter. That is all.

MERCHANTS in San Francisco and business men in California are indignant at the proposal of the Union Pacific, or Harriman, railroad to increase the freight toll on merchandise to or from California common points. We hope they will continue to be indignant and translate their feelings into vigorous action. This is no time for the railroad company to levy increased charges; the threat to do so indicates the irresponsibility of those in control. In the year 1907 the Union Pacific Railroad Company earned $87,627,000 gross and $47,053,000 net as compared to $77,610,000 and $42,349,000, respectively, in 1906. Thus even the panic did not stop the wonderful expansion of business that has marked this railway enterprise since 1897, when the company was re-organized. Even the fixed charges were only $1,926,000 per mile in 1907 as compared to $2,600,000 in 1904. The surplus was $36,178,000, the largest in the company's history. In 1908 the gross earnings have continued to grow, and the curtailment of operating expenses has been such that the ratio is 45 per cent, as against 60 per cent in 1907. The railroad is extraordinarily prosperous, having the control, political and industrial, of a vast region, rich in natural resources. The present rate of dividends is 10 per cent on the common stock and 4 per cent on the preferred. Owing to this showing the stock has been advanced to the highest figures on record, the common selling for $185 and the preferred for $98 per share. The people that pay tribute to the railroad have suffered severely from a period of industrial depression while the railroad company has been enriched at an unheard of rate. And this is the time chosen for the levying of an increased impost on the traffic of the West! It is another example of the colossal impudence of Mr. E. H. Harriman.

CONGRATULATIONS to the Geological Survey on escape from a great disaster! On the night of December 16 a fire broke out in the Hooe Building, at 1324 F street, Washington, and imperiled records of the greatest value. The fire was detected by the night watchman; apparently it started in the elevator shaft on the sixth floor and spread to the fifth floor, where the Water Supply division has headquarters. Here records, chiefly maps and photograps, were burned. On the floor above is the collection of photographs that form so attractive a feature of the Survey reports; these, we much regret to say, were destroyed. But the library was uninjured and the statistical records of the Mineral Resources division, on the second and third floors, suffered no harm. At the time of the fire the Director, Mr. George Otis Smith, and the chief of the Technologic Branch, Mr. J. A. Holmes, happened to be in the building; from press reports we gather that both of these gentlemen did excellent work in saving valuable papers and assisting the firemen. Whether Mr. Smith and Mr. Holmes were having a warm discussion, and whether the anticipated friction between the Survey and the proposed Mining Bureau developed enough heat to set the building on fire, is not related. We rejoice in the escape from a calamity.

FROM REPORTS of proceedings on the Boston and New York exchanges it appears that stocks have been depressed by unloading of large blocks of shares by leading operators. A sapient commentator in the daily press says: "The exact meaning of the present liquidation is difficult to determine." The humor of it! It is the same old game, young man; the same old game that has been played time out of mind. First optimistic talk and rosy prophecies of expanding business, then boosting of stocks to a level that even the complete fulfilment of expectations would not warrant, then a buying movement by the same old guileless public, with gentle unloading at top prices on the part of the 'insiders,' namely, the comparatively small group of clever manipulators to whom the Stock Exchange is a veritable mint. When the election of Taft promised restoration of confidence, when the blight on business seemed about to be lifted, when the invincible progress of this great country seemed assured—and when all these factors had been liberally discounted by the knowing ones—then the public, 'the man on the street,' the widows and the orphans, the sheep and the 'lambs' that follow the pied pipers of Wall

Street, all rushed to their brokers and bought stocks. Then the 'big fellows' who sell with the 'boom' and buy with the 'bust,' began to dole out their stocks to the simple and greedy from the Atlantic to the Pacific, and even on the other side of the Atlantic. The process is not mysterious and it is not new, although the scribes of the daily press try to make it appear wonderful.

Railroads in Western Mexico.

The first railroad from the Mexican plateau to the Pacific Ocean was formally opened to traffic on December 12 by President Diaz, in the presence of a distinguished company of representative men. This pioneer road across the Sierra Madre is a branch of the Mexican Central from Guadalajara to Manzanillo, a port in the State of Colima, 250 miles west-northwest from Acapulco. Its completion is a notable event, as are all steps for the utilization of natural resources, and it justified the elaborate celebration that was further honored by the presence of the great leader of Mexican progress. Although it may not appeal to the world as did the opening of the Tehuantepec line, it is of greater practical importance. The saving in world-freight by the trans-isthmian road in ten years will not equal the increase in property-value of a single year which the development of the West Coast of Mexico will occasion. This region has remained virgin to agriculture and commerce. It was not the natural obstacles to railway construction that retarded the Pacific zone. Although the canyons were deep, and the mountains rugged, the difficulties were not insuperable. The West Coast was neglected because it was not then needed. But the time is now ripe. Land-hunger is leading to the development of the rich deltas that stretch for hundreds of miles from Manzanillo to Guaymas. The Southern Pacific Company is building a great railroad, now almost completed, establishing communication between the main line of the trans-continental system in Arizona, by way of Guaymas, Culiacán, and Mazatlán, to Guadalajara. Thus will a second trans-sierra route be opened within a year, and other roads will follow. The Kansas City, Mexico & Orient Railway lacks only the mountain division in Chihuahua to afford another, which will be the shortest cut from New York to tide-water on the Pacific. At the western terminus is the deep harbor of Topolobampo, sheltered by converging mountains. From this port the line is open to traffic as far as Choix, an important copper district. The route across the Sierra lies close to such well known mines as Lluvia de Oro, Batopilas, Concheño, and Pinos Altos. The Miller and Sibley mines at Topia, said to have developed the largest known body of lead-ore in America, will shortly call for rail connection westward to the new road of the Southern Pacific Company, and the purchase by the Standard Oil Company of enormous pine-reserves on the plateau, stretching eastward from Topia, will necessitate extension of the line to the Mexican International at Tepehuanes. Thus will be completed the work planned and surveyed by Mr. E. P. North, the pioneer railroad builder on the Pacific seaboard of Mexico, 30 years ago. Because of isolation, these western States have only begun the development of their mineral resources; many mines along the great escarpment that forms the seaward front of the Sierra Madre—El Tajo, Guadalupe de los Reyes, San José de Gricia, to name a few—have produced millions, and where so much has been won in the face of almost throttling difficulties, more is to be expected when highways are created. The opening of the railroad from Guadalajara to Manzanillo marks the offering of a new field to industrial development.

Mining Law in Alaska.

The ability of one person to stake an unlimited number of mining claims is a hindrance to the development of Alaska. A prospector can go up a creek and stake for himself and his friends as many claims as he likes, provided he makes a discovery on each claim of 20 acres; or, he can stake an 'association' claim of 160 acres in the name of eight men and with but one discovery. The use of the other men's names on the notice of location is often a subterfuge to avoid the operation of a district regulation limiting an individual to a single claim; frequently the names are used without authorization, and the presumption that a person has authorized an act that is for his benefit operates to validate the action taken in his behalf. The practical result is that the country is blanketed with such locations, made, not by bona fide prospectors, but by speculators. Judge Wickersham comments on the situation, in one of his opinions, as follows: "The greatest evil in the administration of the mining laws in Alaska is the habit of the shiftless and grasping in staking and recording mining claims, generally by power of attorney, whereby one person often acquires a claim to a large area of supposed mineral land, and excludes the willing miner from working it and developing the resources of the territory. Since the threat of a lawsuit lurks behind each of these pretended locations, the prospector generally passes it by, and thus the speculative locator controls the property."

On the Totatlanika, two years ago, a party of five men staked 16,000 acres. In the Bonnifield country, a party of four located 27,000 acres. This is a gross perversion of the law, of course. Last year two men went from Hot Springs to Sullivan creek and located four miles for a width of 1000 ft. in association claims, using the names of people residing in the neighboring district. Then they notified these people that they had been 'staked' and asked them for $50 or $100, on account; if they paid, all was well; if they refused, the name on the location notice was erased, and another was inscribed. Thus the same claim was sold several times over, and then the perpetrators skipped, remaining away until the affair had been forgotten. In Judge Wickersham's court in 1906, when the validity of a 'muck discovery' was in dispute, a witness testified that he had walked from Fairbanks to Cripple creek, a distance of eight miles, and had then staked 10 claims of 20 acres

each, placed upper and lower centres and four corner posts, blazed his boundary lines, made a 'discovery' with a pie plate on each of the 10 claims, and he did this (so he testified under oath) on April 15, when the snow lay two feet deep in the woods. It is estimated that he walked 42 miles, to say nothing of the time spent in preparing the notices, and so forth. Bedrock was 165 feet below the surface, and 135 feet of 'muck' covered the gravel! Comment is superfluous.

'Discovery' is the feature of the law that is most abused. Without a valid discovery, a location "would be justly treated as a mere speculative proceeding, and would not itself initiate any right," in the language of the United States Supreme Court. And yet in Alaska, where the pay-gravel is buried beneath many feet of frozen 'muck', claims are staked by the wholesale without any attempt to penetrate through material that is not mineral-bearing. Such claims are invalid, and after the lapse of a reasonable time the courts will not protect the locator for the purpose of allowing him to make an actual discovery. Another locator may then step in and perfect an adverse claim by making a sufficient discovery. The courts have also held that the mere presence of gold 'colors' on or near the surface, unless connected in some way with the deeper lying and valuable deposit, does not in itself constitute a valid discovery. Of necessity, a determination of each case depends upon its own facts.

The effect of these practices is to keep the bona fide prospector off the ground. He may work ever so hard and explore ever so energetically, only to find himself in a lawsuit, his ground having been staked by an itinerant and haphazard speculator. If some restriction were placed upon the power of attorney, and each locator were compelled to make a valid discovery and do the required amount of assessment work, the golden regions of the North would undergo rapid development.

The performance of annual labor, or so-called 'assessment work', to the extent of $100 for each claim is also frequently evaded or perfunctorily performed. To comply with the law, such work must actually benefit the location for which it is performed, and it must facilitate the extraction of mineral therefrom. In Alaska a shaft 10 or 12 feet deep in 'muck' is considered the equivalent of $100 in value, but usually such an opening is filled by thawing in one season and the work wasted. There are many who feel that the amount of work required should be increased. Under the existing law the ground may be 'tied up' or sequestrated for two years without any real prospecting. This is a long time to postpone development, and it would seem to be wise to require a certain amount of 'location work,' as in Nevada and other mining States.

We have called attention to these serious hindrances to legitimate mining in Alaska, not so much with the idea of proposing alterations of the existing laws as to point out wherein the real trouble lies. The existing mining laws have been in operation for many years, and while they are by no means ideal, yet their chief value lies in affording security of title. To trifle with the laws and seek legislation as a remedy for every real or imaginary evil will only tend to produce confusion, insecurity of title, and additional opportunity for litigation. The grievance lies not so much against the laws as they exist as against their evasion. The remedy is not to be found in their alteration, but rather in their enforcement. To quote again from the opinion above referred to: "One of the cures for this speculative reservation of mineral land is presented in this case. The Court ought not to assist a mere staker, after he has had a reasonable opportunity and time within which to do the necessary work to make a discovery on his claim, by restraining another prospector who seeks to go upon the land and comply with the spirit of the law by mining for gold thereon." This is not the first time in history that these evils have been encountered. By referring to an authority on the subject of tin mining in Devon and Cornwall, we find that the "laxity of stannary law in respect to the enforcement of the required amount of annual labor gave many opportunities for the abuse of the right of bounding (staking) in the Middle Ages, and in 1786 all Dartmoor, comprising 50,000 acres, was claimed by a single prospector." The same abuses spring up in every new mining region. In the case of Alaska, the wild nature of the country, the severity of the winter, the limited population, the great distances and hardships to be overcome in traveling, and the consequent inaccessibility of the Courts to certain parts of the country, all tend to make difficult the strict administration of the law, whether it be civil or criminal. It is little wonder that lawlessness is in evidence in places, and hope for the improvement of these conditions in the future lies in the steady development of the country and the increase of a law-abiding population, rather than in a resort to legislation with the idea of improving existing laws. To compel a locator to make a bona fide discovery, or to go into possession and work till he effects a discovery, and to enforce the performance of the requisite labor on each claim annually, will do more to check the indiscriminate and wholesale locating of the mineral lands of the public domain by speculators than any new mining code that could be devised.

The Write-Up.

The exploitation of a manufactured product in the guise of reading matter is called a 'write-up.' It is not a literary word and it does not represent literature; it is the exponent of a commercial idea in the guise of scientific or technical information. In the daily press you find yourself reading a paragraph that begins with a seductive reference to the "grandeur that was Greece or the glory that was Rome" and ends by recommending Snooks' soap. In the financial press you become absorbed in a picturesque account of South African mining only to discover that you have been inveigled into a consideration of the opportunity for sudden wealth presented by the shares of the Great Bullion Extended Mining Co. in southern Nevada. In a technical paper you plunge into a turbid description of pumps and

their work in mines, to find that the purpose of the article is to recommend the Jones centrifugal pump manufactured by the Jones Co. of Jonesville, Tennessee. If you are good natured, not too busy, and possessed of a sense of humor, you laugh at yourself as the victim of a practical joke; if, however, your liver is sluggish, or you are a busy man, or do not appreciate foolery, you kick yourself for being deceived and there is developed a longing to express your sentiments to the responsible editor. Undoubtedly, the 'write-up' is in the nature of an impertinence. But besides the cruder forms of this insidious method of gaining publicity without payment, there are unaffected descriptions of manufactured products that appear in trade and technical papers.

Thus the write-up becomes a specious indorsement of one advertiser's wares at the expense of the other advertisers, and eventually it is to the detriment even of the favored individual. For it is obvious that if a 'write-up' is not as trustworthy as matter coming from an unprejudiced source, then it lessens the interest of the reading portion of the paper and renders the advertising less valuable. There is no escape from this conclusion. The representative of a machinery firm brings a description of his works, with a photograph of the establishment, and wants it published as reading matter. The sight of it in the paper may gratify the members of that particular firm, but it is certain that it is of value to no one else, for the products of manufacture do not depend for their excellence on the appearance of the building in which they are made. Moreover, the insertion of such an article is not fair, for the advertiser is simply asking for so much gratuitous advertising in a part of the paper where he thinks he may get exceptional publicity. The reader is annoyed, for the 'write-up' is not of interest to him; he does not rate Smith's pumps by the look of Smith's factory. It comes to this, that anything which lessens the interest of the reading pages tends to hinder the purpose of the advertising; protect the reader and you safeguard the advertiser, for no one that has become annoyed or displeased with the reading matter is likely to spend much time over the advertisements; on the contrary, it is the satisfactory character of the articles that will cause a reader to hold a paper in his hands long enough to turn over the pages of advertisements.

But we shall be told that there are write-ups and write-ups; that what we have said may apply to certain forms of this method, but it does an injustice to the skillful write-up, which gives reliable information while incidentally fulfilling another purpose. This is a matter of opinion. Even the best of the stuff sent broadcast by the publicity bureaus of manufacturing companies is prejudiced, among the facts lurk fallacies, between the scientific data are sandwiched the exaggerations of a salesman. It may be a long way from the fervid rot of a corn doctor to the pseudo-scientific literature of a publicity manager, but there is every gradation between them and they are tainted by the same fatal defect. It is the editor's duty to protect his reader; in so doing he advances the best interests of the advertiser, for by such methods the advertiser is given the best opportunity to win the attention of the reader. For this reason the signed article that masquerades as an independent statement, while really the puff of an advertiser, is particularly objectionable. Not content with self-laudatory paragraphs, some manufacturing firms employ technical men to write articles for publication, in which the principles underlying certain types of machinery are specially advocated, so as to prepare the way for the reception of a recommendation of the machines themselves. Of course, there is no reason why the inventor or the manufacturer of a machine should not tell the truth in an interesting way, and it happens often that information concerning processes and devices can be obtained only from such sources. In that case, the position of the author should be frankly stated; it certainly would be deemed a courtesy to the reader and would tend to inspire confidence. Any feature of the reading pages that wins the confidence or commands the respect of the reader, by so much increases the value of the service given to the advertiser.

Is this Utopian and impracticable? We trust not. It is sound business, not poetry. The practice of recommending mining stocks and puffing companies in the editorial columns because they advertise their prospectuses on another page has died out in America, that is, among journals of any standing. In London the mining papers are still subventioned in various ways; the mining company pays for an account of its meeting, for the publication of reports, for reprints of the speech made by its chairman, and for sundry other ways in which it gets favorable publicity; the papers distribute praise or blame, or maintain an ominous silence, according to the amount of advertising taken with them. Paid matter appears in the heart of the reading pages, the right hand watches the left, the business department and the editorial are partners in a sordid business. And what is the result? The advertising pages have scarcely any value. Why? Because the reading matter is unreliable. There you have it. In America the leading mining journals do not insert paid matter in their reading pages, and the only blemish is the 'write-up,' which is a sop to Cerberus, the donation of extra publicity gratuitously to those who advertise, or are expected to advertise, in the paper. This reminds us of a petty form of 'graft' operated in connection with write-ups. A firm that does not advertise with you will send a write-up "because it is interesting" and it will have the cheek to ask you to publish it to the end that its products may be advertised free. This does an injustice to the advertiser that pays. The excuse to be made for the 'write-up' is that it is a courtesy to a client, a concession to one with whom you are doing mutually profitable and honorable business, therefore when a non-advertiser asks for advertising space in your reading pages he exhibits monumental effrontery. Your reader does not even have the satisfaction of turning to the advertising pages for further information. A young man obtained a testimonial as to his ability from *his own mother*. That is the 'write-up' in its simplest form—interesting to the family!

BY THE WAY.

At the recent meeting of the British Association for the Advancement of Science, Professor John Joly gave an address on 'Uranium and Geology'. He said, in part:

In our day but little time elapses between the discovery and its application. Our starting-point is as recent as the year 1903, when Paul Curie and Labord showed experimentally that radium steadily maintains its temperature above its surroundings. As in the case of many other momentous discoveries, prediction and even calculation had preceded it. Rutherford and McClung, two years before the date of the experiment, had calculated the heat equivalent of the ionization effected by uranium, radium, and thorium. Even at this date (1903) there was much to go upon, and ideas as to the cosmic influence of radio-activity were not slow in spreading.

I am sure that but few among those whom I am addressing have seen a thermometer rising under the influence of a few centigrams of a radium salt; but for those who pay due respect to the principles of thermodynamics, the mere fact that at any moment the gold leaves of the electroscope may be set in motion by a trace of radium, or, better, still, the perpetual motion of Strutt's 'radium clock', is all that is required as demonstration of the ceaseless outflow of energy attending the events proceeding within the atomic systems.

Although the term 'ceaseless' is justified in comparison with our own span of existence, the radium clock will, in point of fact, run down, and the heat outflow gradually diminish. Next year there will be less energy forthcoming to drive the clock, and less heat given off by the radium by about one three-thousandth part of what now are evolved. As geologists accustomed to deal with millions of years, we must conclude that these actions, so far from being ceaseless, are ephemeral indeed, and that if importance is to be ascribed to radium as a geological agent, we must seek to find if the radium now perishing off the earth is not made good by some more enduringly active substance.

That uranium is the primary source of supply can not be regarded as a matter of inference only. The recent discovery of ionium by Boltwood serves to link uranium and radium, and explains why it was that those who sought for radium as the immediate offspring of uranium found the latter apparently unproductive, the actual relation of uranium to radium being that of grandparent. But even were we without this connected knowledge, the fact of the invariable occurrence in nature of these elements, not only in association but in a quantitative relationship, can only be explained on a genetic connection between the two. This evidence, mainly due to the work of Boltwood, when examined in detail, becomes overwhelmingly convincing.

Thus it is to uranium that we look for the continuance of the supplies of radium. In it we find an all but eternal source. The fraction of this substance which decays each year, or, rather, is transformed to a lower atomic weight, is measured in tens of thousands of millionths so that the uranium of the earth one hundred million years ago was hardly more than one per cent greater in mass than it is today.

As radio-active investigations became more refined and extended, it was discovered that radium was widely diffused over the earth. The emanation of it was obtained from the atmosphere, from the soil, from caves. It was extracted from well waters. Radium was found in brick-earths, and everywhere in rocks containing the least trace of demonstrable uranium. In 1906, R. J. Strutt, to whom geology owes so much, not only here but in other lines of advance, was able to announce, from a systematic examination of rocks and minerals from various parts of the world, that the average quantity of radium per gram was many times in excess of what Rutherford estimated as adequate to account for terrestrial heat-loss. The only inference possible was that the surface radium was not an indication of what was distributed throughout the mass of the earth, and, as you all know, Strutt suggested a world deriving its internal temperature from a radium jacket some 45 miles in thickness, the interior being free from radium.

Did time permit, I would indeed like to dwell for a little while on the practical aspect of measurements as yet so little used or understood; for the difficulties to be overcome are considerable, and the precautions to be taken many. The quantities dealt with are astoundingly minute, and to extract with completeness a total of a few billionths of a cubic millimetre of the radio-active gas—the emanation—from perhaps half a litre or more of a solution rich in dissolved substances can not be regarded as an operation exempt from possibility of error; and errors of deficiency are accordingly frequently met with.

Special difficulties, too, arise when dealing with certain classes of rocks. For in some rocks the radium is not uniformly diffused, but is concentrated in radio-active substances. We are in these cases assailed with all the troubles which beset the assayer of gold who is at a loss to determine the average yield of a rock wherein the ore is sporadically distributed. In the case of radium determinations, this difficulty may be so much the more intensified as the isolated quantities involved are the more minute, and yet the more potent to affect the result of any one experiment. There is here a source of discrepancy in successive experiments upon those rocks in which, from metamorphic or other actions, a segregation of the uranium has taken place. With such rocks the divergences between successive results are often considerable, and only by multiplying the number of experiments can we hope to obtain fair indications of the average radio-activity. It is noteworthy that these variations do not, so far as my observations extend, present themselves when we deal with a recent marine sediment or with certain unaltered deposits wherein there has been no readjustment of the original fine state of subdivision, and even distribution, which attended the precipitation of the uranium in the process of sedimentation.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. L. Benedict is here.

Lawrence Read is at London.

E. P. Mathewson is at Salt Lake.

Cyrus Robinson has gone to Europe.

S. F. Shaw is at Tombstone, Arizona.

Thos. H. Leggett has returned to New York.

George W. Wilkins has gone to British Guiana.

A. Chester Beatty is at Pasadena for Christmas.

C. M. Eye is visiting the mines at Taracol, in Korea.

Saville Lobb is in the Gowganda Lake district of Ontario.

Arthur Thacher has returned to St. Louis from New York.

Eugene Braden has returned to San Francisco from New York.

P. R. Bradley has returned from British Guiana to New York.

A. E. Carlton, of Cripple Creek, is expected at Sylvanite, New Mexico.

Douglas Waterman is examining a mine in Calaveras county, California.

J. Gordon Hardy is consulting engineer for the La Republica Mining Co., in Chihuahua.

G. H. Russell and H. P. Gordon are doing some special mill-work at Murphy, California.

E. B. Durham has been appointed associate professor of mining in the University of California.

D. L. H. Forbes is superintendent of construction for the Esperanza Mining Co., at El Oro, Mexico.

A. F. Wuensch, of Denver, is consulting engineer for the Holcomb mine, at Sylvanite, New Mexico.

W. H. Bunce, of Denver, is on his way to Buenos Ayres, Argentina, to be gone for about five months.

Marshall D. Draper is now manager for the Fifty Consolidated Gold Mines, at Blackhawk, Colorado.

J. B. Tyrrell has returned to Toronto after examining mines in the Sturgeon Lake district of Ontario.

P. R. Whitman is with the Virginia & Mexico Mine & Smelter Corporation, Hostotipaquillo, Jalisco, Mexico.

Herbert Strickland has been appointed superintendent of the Black Rock mine, in Maricopa county, Arizona.

I. Cicerón Castillo, general manager of the Sindicedo Minero del Condoto, Chocó, Colombia, is in San Francisco.

Francis W. Sewell, assayer, recently with the Great Boulder Proprietary mine, at Kalgoorlie, has gone to Mexico City.

H. C. Cutler, consulting engineer for the Nixon & Wingfield interests, has returned to Goldfield after a three weeks trip examining properties in Sonora, Mexico.

Scott Turner has been appointed assistant to W. F. Ferrier, geologist to the United States Smelting, Refining & Mining Co., with headquarters at Redding, California.

The Pacific Coast division of the Mining and Metallurgical Society of America held its second meeting at the Hotel St. Francis, in San Francisco, on December 19. Those present were M. L. Requa, C. W. Merrill, S. B. Christy, H. W. Turner, F. W. Bradley, C. C. Derby, Clifford G. Dennis, Whitman Symmes, Albert Burch, Howard D. Smith, W. H. Shockley, Charles Butters, T. A. Rickard; also two guests, Luther Wagoner and William Erb. S. B. Christy was elected Chairman. Communications from Theo. B. Comstock and F. S. H. Merrill were read. The discussion of the best methods to protect investors was continued from the previous meeting. The next meeting will be held at 6:45 p. m. on January 30, at the same place.

Latest Market Reports.

LOCAL METAL PRICES—December 23.

Antimony	12@16c	Quicksilver (flask)	$46@46
Casting Copper (scrap)	8⅛@13⅛c	Spelter	6¼@7c
Pig Lead	4.55@5.50c	Tin	32@33½c

SOUTHERN NEVADA STOCKS.
San Francisco, December 23.

Atlanta	$ 20	Laguna	$ 1.30
Belmont	78	MacNamara	33
Booth	35	Manhattan Con	5
Columbia Mtn	19	Midway	20
Combination Fraction	1.40	Montana Tonopah	72
Daisy	72	Nevada Hills	1.35
Fairview Eagle	30	Rawhide Queen	50
Florence	4.45	Sandstorm	20
Gold Bar (Bullfrog)	2	Silver Pick	11
Goldfield Con	9.00	St. Ives	18
Gold Kewenas	30	Tonopah Extension	45
Great Bend	26	Tonopah of Nevada	6.00
Jim Butler	17	Tramp Con	10
Jumbo Extension	21	West End	31

(By courtesy of W. C. Ralston, 353 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices, December 23.		Closing prices, December 23.
Adventure	9	Nevada Con	19
Ahmeek	125	North Butte	83¼
Allouez	——	Old Dominion	57¼
Amalgamated	81½	Osceola	128
Arcadian	3¼	Parrot	28¾
Boston Con	15¼	Phœnix	60
Butte Coalition	27⅛	Quincy	93
Calumet & Arizona	117	Rhode Island	5⅛
Calumet & Hecla	660	Santa Fe	2⅜
Centennial	31½	Shannon	17
Copper Range	80¼	Superior & Pittsburg	16¾
Daly-West	10	Tamarack	79
Franklin	16¼	Trinity	16½
Granby	105½	United Copper Con	12½
Greene-Cananea, ctf	11⅝	Utah Copper	44⅜
Isle Royale	22¾	Victoria	3¼
Mass	6⅞	Winona	6
Mohawk	68½	Wolverine	150

Publications Received.

Geologic Reconnaissance of a Part of Western Arizona. By Willis T. Lee. Bulletin No. 352, U. S. Geological Survey.

Notes on Some California Minerals. Arthur S. Eakle. Bulletin of the Department of Geology of the University of California.

Notes on a Collection of Fossil Mammals from Virgin Valley, Nevada. By James W. Gidley. Bulletin of the Department of Geology of the University of California.

Catalogues Received.

The American Well Works, Aurora, Illinois, is distributing its Bulletin No. 105, which is a 200-page catalogue of well drilling and prospecting machinery and accessories. It is an unusually complete and well illustrated book.

The Bausch & Lomb Optical Co., Rochester, New York, announces its 'Hand Book for Engineers' for 1909. This book, of vest pocket size, contains the Solar Ephemeris for 1909, and also directions for using the Saegmuller solar attachment, now so universally employed. There are directions, with diagrams, for using and adjusting the engineers' wye level, the dumpy level, and the transit, as well as other useful information. It will be sent free of charge upon request.

L. Vogelstein & Co., New York, give the following figures of German consumption of foreign copper for the months January to October, 1908:

	Tons.
Imports of copper	135,347
Exports of copper	7,342
Consumption of copper	128,005

as compared with consumption during the same period in 1907 of 96,395 tons. Of this quantity 124,408 tons were imported from the United States.

General Mining News.

ALASKA.

The copper mines in the Ketchikan district suffered a considerable setback early in the year because of the decrease in the market value of that metal, and except at the Jumbo mine operations were suspended during the winter. The Mount Andrew and Rush & Brown mines were idle throughout the year; at the Mamie and Stevenson mines activities were renewed in August, and a relatively large amount of ore was mined, which was treated at the Hadley smelter. Explorations at these mines are to be advanced during the winter months, though the smelter suspended operations in November and no ore will be shipped. The largest production and most extensive developments during the year were made at the Jumbo mine, near Sulzer. The operations on this property were confined to the sulphide deposits at the head of Jumbo Basin, and only small developments took place on the copper-bearing magnetite deposits on the north side of that basin. The Niblick mine was operated from April 15 to October 30, during which period the shaft was sunk to a depth of 360 ft. and developments were extended on the 300-ft. level, where two orebodies were opened. Raises were made in these orebodies to connect with the 225-ft. level, and most of the ore thus developed was mined. At the It mine, on Kasaan peninsula, mining operations were begun by the It Mining Co. early in the spring, and a body of high-grade copper ore was developed. A tramway one mile long was built to tide-water, a wharf was erected, and ore shipments were begun in the first part of October. The copper production of southeastern Alaska for 1908 will be considerably less than that for 1907, but the average content of copper per ton of ore mined will be somewhat greater.

ARIZONA.

COCHISE COUNTY.

The Nashville company that owns the Gunsight mine, at Juniper falls, four miles from Bisbee, is preparing to install a mining plant at once and proceed with development. It is said that $50,000 is to be spent.——Reports indicate that a large body of 15% copper ore has been found about 500 ft. south of the shaft on the 600-ft. level of the Shattuck.

GILA COUNTY.

The Inspiration property, eight miles west of Globe, is under option to New York capitalists, and it is said a large company will be organized to work it on a large scale. The Inspiration has about 15,000 ft. of underground workings and 1,500,000 tons of ore partly blocked out. It is said that W. H. Thompson, of Boston, and George E. Gunn, of Salt Lake, are interested in the new company.

GRAHAM COUNTY.

The San Juan mines, at Safford, have started again and a force of men is now engaged overhauling machinery and pumps preparatory to sinking a new shaft. The company has built a new road from the foothills to the San Juan mine, a distance of several miles. The old road was completely destroyed last summer by a cloudburst. The pipeline from San Juan to Walnut Springs, from which the company gets the water supply for the camp, was also destroyed for about a mile near the spring by the big flood last summer, but has been repaired, new pipe put in place, and the well cleaned out. At Walnut Springs the company has a pumping plant, and the water is being pumped to the reservoir and water tank at San Juan.

MARICOPA COUNTY.

Herbert Strickland has been appointed superintendent of the Black Rock Limited mines in the Black Rock district. A mill was built on the property about a year ago, but proved inefficient in extracting the gold from the ore. The employment of a competent man to manage the plant is a step in the right direction and will probably result in solving some of the Black Rock's problems. Mr. Strickland is a graduate of the Royal School of Mines.

MOHAVE COUNTY.

The Little Wonder Mining Co., operating the old Wildcat vein, in the Chemehuevis mountains, have a shaft down 95 ft. and have a vein of ore running four feet wide. This ore is said to carry 14% copper, 10% lead, $8 gold, and 20 oz. silver per ton. The company is to thoroughly exploit the vein and expect to prove up a good property. A whim is to be placed on the mine at once and the shaft sunk to 100 ft., where drifts will be started.——Thomas Hogan is getting things in shape to begin work on his mining claims in the Thumb Butte section of Union Pass. Interested with Mr. Hogan in these properties are J. C. Potts and L. Kimmerly. The mines are known as the Golden Glance group, and have been explored to a considerable depth and have a splendid showing of gold ore.——S. E. Barron and partners have completed location work on a group of mining claims in the Chemehuevis mountains.——Henry Harding and Joe Marinez have taken a lease on the property of the Franconia Mining Co. and are getting ore that will run about $100 gold per ton when assorted. While the vein is not large the orebody is regular and the ground easily workable. They have a shaft 125 ft. in depth on the vein. ——A. L. McKesson is putting his hoist on the Santa Fe mine, six miles south of Kingman and will soon be at work sinking the shaft to a depth of 100 ft. He has some good ore in sight in this property and believes that he will shortly be milling ore from it.

YAVAPAI COUNTY.

Thomas E. Campbell, of Jerome, is directing operations at the Jerome Verde—formerly the Verde-Queen—in addition to his duties as general manager of the Hayes Copper Company.

YUMA COUNTY.

The superintendent of the Big Stick Mining Co., with a force of men is at work dismantling the Sultan mine in the Santa Maria district. The mill will be installed at the Big Stick G, M. Co.'s property. Work will be rushed as fast as possible.——The Ironwood & Arizona property, formerly known as the Griffin-Linn group, ten miles northwest of Salome, is about to change hands, and notices have been sent the stockholders to meet at Harqua Hala to consider the proposition of the Butte & Arizona Copper Mining Co., which offers $150,000 in stock for the I. & A. and will assume the indebtedness of $73,000 yet due to Griffin Bros. and Capt. Lind. The Butte & Arizona is a company originally organized by E. A. Haggott to work the claims lying east of the well known Blue Bell mine, near Mayer, Yavapai county, before the closing of the Humboldt smelter.

CALIFORNIA.

INYO COUNTY.

(Special Correspondence).—The Buckeye M. Co. has awarded a contract for the erection of a 50-stamp mill on its property at Fish Springs. The Company has opened up good reserves of low-grade free-milling ore and is employing a large force of men. At the 150-ft. level of the shaft a 56-ft. vein of $6 ore has been cut. Approximately $50,000 has been expended in developments. Mansfield, Ohio, people, are interested. A. A. Casler is superintendent.——The new adit at the North Inyo Con. mine is in 1300 ft. A 20-ft. vein of low-grade ore was recently cut. M. T. Stovall is manager.——A small vein carrying gold and silver has been struck in the Nichols mine at a depth of 12 ft. It is proposed to install a mill and cyanide plant. The mine lies near the Indian Queen.——A small quantity of high-grade ore has been found in the surface workings of the Red Rose mine. A lower adit is being driven to cut the vein and is in about 250 ft.——The Four Metals Co. has practically completed its electric light and power plant at Lone Pine. Ore from the old dumps at the Cerro Gordo is being sent to the Keeler smelter.——Two shafts are being sunk at the Flier, the deepest being down about 65 ft. The vein is four feet wide and runs about $40 per ton in silver and lead. Arrangements are being made for a large shipment to Keeler.——The Christmas Gift mine has shipped some silver-lead ore to Keeler and is arranging to

push more extensive work. Dan McLeod is owner and manager.——Archie McMahon is operating a dry placer near Darwin with good results. A placer outfit, including dredge and washer, has been installed.——Arrangements are under way to re-open the Indian Queen mine. This property is said to have produced $6,000,000 and has never been worked below the 300-ft. level.——Rich placer discoveries in Crooked canyon, on the east slope of the White Mtn., has caused a small rush from near-by points. The region is isolated and difficult to reach.——The Monster mine, in Lead canyon, has been sold to New York capitalists. The consideration is said to be $20,000 and 25% of the net proceeds from the ore shipped until final payment is made. At least 100 tons of ore per month must be shipped. Considerable ore is blocked out and the working force will be increased. J. P. Fitting is superintendent.——Fifteen men are working at the Inyo Coso property and the work of installing the three-mile pipe-line has been completed. It is expected that the mill will be completed by January. W. H. Washburn is superintendent.——A movement is under way to build a railroad from Ubehebe to connect with the projected Goldfield-Ely railway. Such a road would open up a large market for the fluxing lead ores of the Ubehebe district. Tonopah mining men are interested.——The shaft at the Furnace Creek mine is going down slowly. It is the intention of the management to sink to the 1500-ft. level. W. J. Casey is superintendent.

Bishop, December 21.

PLACER COUNTY.

The stamp-mill at the old Bonanza mine at Gold Run is being replaced by crushers and rolls to be used in breaking up the cemented gravel. J. D. Stewart is superintendent.

TUOLUMNE COUNTY.

Preparations are being made to begin work at the Ellen Winton, above Groveland.——An English company has taken a bond on the Seminole, above Soulsbyville, and are preparing to begin operations as soon as water can be procurred.——A company of which H. H. Cole is president, W. M. Stover vice-president, and G. Lee Stout, Jr., secretary and treasurer, has bought the Republican mine near Jacksonville. Arrangements are in progress for beginning work at the property.——An English company of which C. F. Crawford, at present at the property, is president, has purchased of Joseph Russell the Tarantula, near the Shawmut at Jacksonville. Of the selling price, $7500 has been paid. As a forerunner of active operations an air-compressor and machine drills have been ordered.——August Hagberg, of Duluth, Minn., has purchased from Walter G. Cole a one-half interest in the Jessie W. (formerly U. S. Grant) and all of the Schuyler Colfax. He also bought the Washburn and Evarts from Frank H. Warren. All these claims are on Grant Ridge, about two miles from American Camp, in a district that is noted for its many good gold mines.

SIERRA COUNTY.

A few more men have been put on at the Papoose mine in Jim Crow canyon, to add the extra five stamps to the mill. George Gaberel has gone up to do the carpenter work.——The new shaft at the Alaska mine at Pike is said to be within 25 ft. of the depth of the old one, and as soon as an equal depth is obtained a cross-cut will be run to tap the old works in a couple of weeks more.——R. G. Mead has arrived from the East to take active charge of the operations of the Snowden Hill mine owned by the American M. & D. Co. The long adit will be continued to the 700-ft. point and three shifts will be employed. The mine comprises 600 acres, the principal portion of which is patented and covers the lava-capped ancient river channel which occupies the Snowdon Hill ridge, on the south of the Middle Yuba river, a few miles southeast of Brandy City, and was purchased from Jerry Watts about a year ago for $45,000. Since then the American M. & D. Co. has expended about $22,000 in surface improvements, including roads, telephone line, ditches, and buildings.——A strike of rich cemented gravel is reported from the Omega mine near Forest. The Omega was formerly known as the Nellie Bly.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The capacity of the rough-jigging equipment at the Lamartine mine, installed by J. G. Roberts, of Idaho Springs, is to be increased from 50 to 100 tons per day. A high saving has been effected during the last four months, as by concentrating at the Jackson mill two fine products have resulted—a lead and a zinc.——A full force of men is now employed at the Culley adit on Saxon Mtn. The adit is being driven ahead, while driving is under way on both the Pineo and Clyde veins, intersected 800 ft. from the portal. J. J. Culley, who is manager, expects to start steady shipments shortly after January 1, as the ground is being prepared for stoping. A streak of ore 12 in. wide is exposed in the stope started on the Pineo vein, that is worth from 175 to 200 oz. silver and from 20 to 25% in lead. Heavier machinery is to be installed in the near future.——A. A. Hayden, secretary of the Golden Glory T. M. Co., states that within a few weeks the manufacturers of the Bennett boring machine will install one of the machines at the Golden Glory adit on Saxon Mtn. In the event that ground can be broken as claimed, a contract will be signed for the driving of 5000 ft. This would take the adit through one of the richest mineral zones of the Georgetown district, tapping at great depth a series of 39 veins. The same company is employing a good force of men at the Drummond mine, on Columbian Mtn. During the last 30 days the adit has been advanced 57 ft., and a streak of silver-lead ore is exposed that is from 8 to 14 in. wide, worth $45 per ton. Shipments will be started soon. It has been decided to install machine drills, power to be secured from the Two American Sisters M. M. P. & E. Co.——The Sigafoos boring machine will be in position within two weeks. The transmission line from the American Sisters electric plant has been run and it will only take about one week to make the connections. A compressor is due to arrive this week for the running of the big machine, which weighs 55,000 lb. In the meantime the Georgetown M. P. & T. T. Co. is employing a force of men in enlarging the adit, which is in a little over 400 ft. The starting of this machine is looked forward to with eagerness in this district. S. McKirahan is manager.——J. H. Crandall is developing a group of claims up Bard creek on Lincoln Mtn. Recently a streak of gold-bearing ore four inches wide was exposed in the breast of the adit, assays of which run as high as 9 oz. gold per ton. This vein is supposed to be an extension of the Virginia City, with a quarter of a million dollars credited to its output.——Lucas & Co. have been awarded a contract for advancing the Homestake adit 150 ft. The bore is now in 175 ft. and from surveys another vein will be reached within from 20 to 25 ft. This property is being operated by a pool of Georgetown business men, A. L. Stephens serving as manager.——It is reported that a big campaign of development is to be started upon the holdings of the Ramsdell G. M. & M. Co. During the past few weeks a force of men has been employed in doing assessment work, but it proposed to at once start work in the advance of the Market adit. The first vein to be cut is the Golden Jack, which on surface makes an excellent showing. G. W. Teagarden is manager.——The McKinley adit is in 555 ft. and for the last 20 ft. a streak of silver-lead has been followed that is from 8 to 12 in. wide, carrying $35 per ton. It is reported that early the coming year machine drills will be installed. R. Emery is manager.——A big force of men is being employed by the Conqueror M. & M. Co., operating a large group of claims on Covode Mtn. A powerful plant of machinery was recently ordered and the equipment is expected to arrive any day. Electric wires have been strung to the property and within 30 days it is hoped to have everything in readiness for operation.——Work in earnest has been started upon the Smuggler property, situated on Brown Mtn. It is reported that shortly after January 1 a force of from 50 to 60 men will be at work. In addi-

tion a number of miners formerly operating under lease have resumed work. Power is to be secured from the Terrible plant.

Georgetown, December 19.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The greatest activity has reigned throughout the Coeur d'Alene during the past week. In Murray a mass-meeting of citizens has been held for the purpose of preparing a suitable celebration on the arrival of the first train over the Idaho Northern railroad. The people of that town believe that this notable event will take place some days before Christmas, which has been substantiated by a statement issued by the president of the railroad company.——In view of the near completion of the Idaho Northern railroad active steps have been taken toward the organization of a company to erect a smelter in the Little North Fork country. Already a number of Wardner men interested in mining throughout the district have taken the matter up, and it is understood that the enterprise is also backed by a number of Portland capitalists. Those interested at the present time are T. R. Mason, P. F. Matchette, and George Harris, of Wardner. The new plant will have a capacity of 100 tons per day, and it is believed that this will be increased as soon as business warrants. The smelter will be entirely different from those already in use in other parts of the country and will operate the patents of Maurice Blanchard, who is in the district at present. The principal feature of the smelter is the fact that coal is used as fuel and that the cost of erection of the plant is only about one-quarter of the cost of the furnaces in use at present.——Stanly A. Easton, of the Bunker Hill & Sullivan mine and of the Pittsburg Lead Mining Co., has announced that work on the latter property, which has been closed down for some time past, will be resumed again about the beginning of the year. It is the intention of the company to sink the shaft for another 200 ft. and then to cross-cut.——An offer of 40c. per share for 100,000 shares of the Black Bear Fraction Mining Co.'s treasury stock, made on behalf of Eastern investors through a Spokane firm of brokers, has just been refused by the directorate of the company. The main adit has been driven about 3100 ft. and it is expected that the vein will be struck at any time. In refusing the offer the management acted for the protection of the stockholders and made a return offer of 50,000 shares of treasury stock at 50c. per share. Negotiations on the latter deal are pending.——W. A. McCune, of Salt Lake City, and Walter Mackay, of Portland, have purchased the Reno group of claims near the Great Western property in the Burke district. Under the new owners a strong force of men will be set to work by February 1 to drive a 1200-ft. adit to cut the ore at depth. The property was owned by Tom Ryan and Charles Eckels and has been extensively developed——A deal has been closed by which the Castle Rock Mining Co. will ship a number of cars of ore to the Panhandle smelter at Sandpoint. The ore is valuable as a flux and the smelting company has agreed to pay the mining company at the rate of $4 per ton, free of all other charges, including freight and duty. The ore carries over 40% iron carbonate, from 2 to 5% copper, $1.25 gold, and from 1 to 3% lead.——The Spring Gulch Mining Co. has paid $22,500 on its bond and arrangements are being made to take up the balance of $12,000 in the near future. The company has made one shipment of ore on which they received returns of $135 per ton, but this is regarded as disappointing, as at least $250 was expected, hence shipments have been discontinued. A force of 12 men is engaged at the mine under the management of Charles A. Pooley, of Mullan.——The vein of the Hypotheek mine in the Kingston district has been cross-cut, showing it to be 20 ft. wide. It is now the intention of the management to sink the shaft another 250 ft. and to cross-cut every 75 ft. The new hoist recently ordered has been delivered at the property and work on its installation has been started. about 150 ft. The drilling is being done from the face of the present adit, which has been driven about 1500 ft., and it is believed that in order to strike the vein, which was opened in the upper workings, 500 ft. more work will have to be done. It is the intention of the company to first test the ground by means of drill-holes and it is expected that the first of these will be completed about Christmas.

Wallace, December 19.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—A number of important strikes have been made recently in the Joplin district. A shallow lead strike was made in the Kansas City bottoms by O. Mansil when a 1000-lb. chunk of ore was taken out at a depth of only 14 ft. The extent of the body has not yet been determined. The chunk had to be broken in pieces before hoisting. In the same vicinity a number of companies are working leases. The Three Johns Co. has struck ore at 40 ft. and opened a 12-ft. face of both galena and zinc-blende. A short distance away Carpenter & Morris are operating a lease at 45 ft. and have both galena and zinc-blende. This latter firm has been making a regular turn-in for several weeks. Other companies operating on the Edwards land are Amos Freeman & Co., the Lucky Jack, and Saum & Co.——A rich drill strike has been made on the Connor land, at Carterville. The drill entered ore at 220 ft. and continued in ore till 240 ft. Two holes have been sunk. Prospecting is being done south of the Old Victor mine, which was once one of the best producers in the Carterville camp.——Good showings of galena and zinc-blende have been found at 35 ft. by T. R. McDonald & Co., at Spring City. The shaft is now down that depth, though the drill-holes did not show ore above 60 ft. A lower run was disclosed at 116 ft., but this will not be developed until later. For the present the ore will be treated on hand-jigs. ——A company of prospectors has made a strike on the Granby land at Oronogo near the old Dew Drop mill. The ore was entered at 15 ft. and a 9-ft. face was penetrated. The driving has not proceeded far enough to learn the extent of the deposit.——A number of old producers are being re-opened, among which is the Kohinoor that has been idle for years. A company recently began prospect work with the result that a shaft has been sunk and ore entered at 150 ft. The ore runs 8 to 10% zinc-blende. At a lower level a second deposit was found and in both instances the face was 20 ft. thick. The old mill, which was in a bad state of repair, has been overhauled. In the meantime a very rich dump-pile has been accumulating.——The Nortonia mill, west of Joplin, has resumed operations after a long shut-down. More machinery has recently been added. The mill is furnished with ore from two shafts which are down 170 ft. The company is working upon the same run of ore as the Lucky Jim, which has been only recently started up. These two properties are the connecting link between the rich Continental tracts and the Smelter Hill group of mines.——The Little Jew mine, northwest of the Driving Park, has been taken over by Kansas City parties and will be re-opened at once. This property was shut down on account of low prices. The ore is found at 150 ft. and a mill of 100 tons capacity is on the lease.——A centrifugal pump has been put in by the Sunset Co., in the Bellville district, and the mine will be thoroughly drained and developed. The shaft will be deepened to catch the lower runs of ore. Operations stopped at this mine on account of the inability to handle the water.——The old Pleasant Valley mines south of Carthage have again entered the producing list. Just previous to last year's panic a great deal of prospecting was done and a large deposit of ore opened on the 170-ft. level. The pumps have now drained the drifts and this run is again being worked.—— The Cameron Co. has begun work on the new milling plant on the Boyd land in the Sarcoxie camp. The mill is to have a capacity of 300 tons and will be completed within 60 days. The Cameron Co. has been at work on this lease for four years and has spent a large sum upon its development.——A new 200-ton mill is being built in the Smelter Hill camp by the Amalgamated Z. & L. Co. Considerable prospect drilling has been done and some excel-

lent orebodies opened up. The deposit occurs in flint and calcite and is the same in character as the Bullfrog and the Blackberry.——A 300-ton concentrating plant is to be erected on the Troope land south of Webb City. It is to be built by the Ave Maria Co. on a 20-acre lease and adjoins the lease where the terrible explosion of a few months ago occurred.——A 300-ton mill is to be built by the Pinnacle Mining Co. at Oronogo on the old Hill Top lease. Work has already begun. The shaft is already in ore, but development has not been completed. The lease adjoins the famous Oronogo Circle group of mines, which are splendid producers.——The Quick Seven Mining Co. at Neck City is building a 200-ton mill on a lease on Spring river. A considerable quantity of ore was taken out during the sinking of a shaft, some nugget zinc being thrown into the bins and the rest treated on hand-jigs. Drifts have been driven under the river, where some good ore has been found.——The Oronogo Circle Co., at Oronogo, has overhauled the No. 2 plant and connected it with shaft No. 5. The sludge from the mill will be sent to No. 5 plant, where special devices have been installed for the extensive handling of sludge from the entire group of mills. A complete telephone system has also been installed.——Jesse & Shultz have started a sludge mill on the old Quaker land at Chitwood. The sludge from the abandoned mine will be run through the mill, which has a capacity of five or six tons per week. The sludge from the pond will be treated, as a large amount of the fine ore has settled in the old millpond.——The initial turn-in from the Buster Mining Co. was made last week. This new property is operating between Bellville and the Badger-Peacock district. The ore is being cleaned on hand-jigs and is taken from the 150-ft. level. It runs as high as 15 to 20%.——Pulsating jigs will be installed in the Lincoln property at Duenweg. They are an innovation in that district and it is thought that the ore can be recovered more economically. The Lincoln is operating on sheet ground which runs from 10 to 17% zinc-blende. The vein varies from 12 to 22 ft. in thickness. The management will erect a 300-ton mill in the immediate future.——Seven carloads of silicate have been produced from the Hall land in the Duenweg district in the past four weeks. This has proved to be one of the best silicate producers of the district. A new shaft has recently reached the 100-ft. level, where drifts carrying a 20-ft. face have been opened up. When the new drifts reach the old ones a 15-ft. stope can be worked.

Joplin, December 19.

NEWTON COUNTY.

(Special Correspondence).—South of Joplin on Shoal creek the Ohring-Junge estate is to be worked. If ore in paying quantities is found a mill will be built. Five drill-holes, all showing ore, have been sunk. The failure in the early-day mining was due to the inability to handle the water.——The new company known as the Western has secured a 40-acre tract of land belonging to the Granby Mining Co. and will develop it thoroughly. About 1000 ft. of drilling will be done at once. The drills have been started and excellent signs of ore have been found.——The Homestake-Mascot Mining Co. is building a 150-ton mill which will be used for a sludge plant and will handle the old tailing pile as well as those made now. The old pile is one of the richest remaining in the district, as it was made in the early days when facilities for saving the fine were not as good as at present. The old sludge pond will also furnish a large amount of ore.——Near Fairview a prospecting company has made a shallow strike of silicate which is exceptionally rich for the shallow depth. The ore was found at only 5 ft., where both silicate and zinc-blende were cut. The extent of the discovery is not known, as the tract has heretofore been virgin ground.

Granby, December 19.

NEVADA.

ESMERALDA COUNTY.

The Tonopah & Tidewater railroad has announced a material reduction on freight rates for southern Nevada ores. All districts will be benefited by the new rates, but Goldfield will profit particularly. The new and old charges are as follows:

	Old Rate.	New Rate.
Ore assaying	$ 20	$ 6.00	$ 3.50
Ore assaying	30	6.50	3.90
Ore assaying	40	7.00	4.40
Ore assaying	50	7.50	4.80
Ore assaying	60	8.00	5.25
Ore assaying	70	9.00	6.75
Ore assaying	80	10.00	7.50
Ore assaying	90	11.00	8.25
Ore assaying	100	12.00	9.00
Ore assaying	150	13.50	10.10
Ore assaying	200	15.00	11.25
Ore assaying	250	16.50	12.40
Ore assaying	300	18.00	13.50

The Henry Clay M. Co., operating on the Cracerjack property, is developing some veins which assay as high as $20 per ton. The company expects shortly to erect a 10-stamp mill.——The St. Ives lease continues to send occasional shipments to the mill, the ore coming from the small shoot uncovered on the 50-ft. level of the old workings several months ago. A. A. Codd is the manager.——J. C. McCormack, president of the Broken Hills M. Co., states that the 50-ton mill, which the company is to erect at Helena, will be in operation by March 1. This company has installed a hoist over the big shaft at the top of the hill, and a hoist will be put up over the new vertical shaft, which is 200 ft. farther down the hill, and has reached a depth of 80 ft. The company continues to make regular shipments to the mill, but will soon be curtailed, and the greater part of the ore held to be treated later on the ground.——The Great Western mine at Hornsilver struck ore at its 300-ft. level, assaying about $34 per ton in gold and 6 oz. silver. E. A. McNaughton is superintendent.——The Hazel Goldfield M. Co. made its first shipment of ore from the lease on the Laguna last week. The shaft is down 740 ft. and will be sunk 100 ft. farther if the vein continues rich.

LINCOLN COUNTY.

The Lincoln-Nevada M. & M. Co., owning property near Pioche, has been re-organized, and Charles A. Bond, of Columbus, Ohio, elected president, and W. M. Jackson, of Marion, Ohio, chosen as fiscal agent. The capital was also increased from $1,000,000 to $1,500,000. The new management will proceed at once with the development of its property.——The Stampede Pioche Mining Co., of which Hans Olson is president, has let a contract to Fields & Burgess for a 50-ft. shaft on the Gypsy group of claims in the Stampede district.——The new machinery of the New York-Searchlight has arrived and is now being put in shape. It includes a 25-hp. gasoline hoist, a 35-kw. generator, a six-drill compressor, and minor pumps and tools. The existing 240-ft. shaft will be deepened to 500 ft. before any lateral work is done. W. W. Hart is general manager.——The Old Mizzoo Co. is to start work on its property at Camp Thurman. M. D. Jackson will have charge of the work, and also manage the operations of the Missouri-Nevada, at Crescent.——John Wheatley, acting for the Nevada-Kingston Development Co., has started work on the Gavilan. This company, which is the successor of the Searchlight Treasurer Gold Mining Co., controls the mineral rights of the original townsite. According to advices from New York, continuous operations may be expected.

NYE COUNTY.

The Sierra Oro Mining Co. will be organized to work the Jim Dandy claim, immediately northwest of the Bullfrog Pioneer property, at Rhyolite, on which the strike was recently made. H. N. Nichols is the moving spirit, and J. R. Bryan will be superintendent.——The Tonopah Mining Co. has declared a dividend of 25c. per share, payable January 21, 1909. The distribution amounts to $250,000, and makes a total of $750,000 returned to stockholders this year.——The total output of the Tonopah mines for the week ending December 19 was 5532 tons, of an estimated value of $138,300.

WASHOE COUNTY.

J. B. Menardi has been appointed receiver of the Selby Consolidated mine, at Jumbo, near Reno. The liabilities of the company are $18,000 and the assets only $8000. It is claimed that the stockholders lost $300,000, and rumors of fraud and 'salting' are freely circulated. A $20,000 mill has been built and has produced only $4000. Among those interested are W. R. Gilbert, J. W. Campbell, A. Y. Werner, and Fred Stadtmuller.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence.)—The lower adit on the Knob Hill mine, near Danville, is now in about 1200 ft. and almost directly under the shaft, to which a raise will be made. That done the company will begin stoping ore and get ready to ship. Fifteen men are now employed.——The Belcher Mining Co. has 14 men employed. The stockholders have agreed to place one-fifth of their holdings in the treasury, which some of the larger stockholders have agreed to sell, for the purpose of pushing development work on the mine.——The Colville M. & S. Co. is preparing to ship a carload of ore to each the Tacoma, Washington, Sandpoint, Idaho, and Carnegia, Pennsylvania, smelters. No ore will be shipped of less value than $100 per ton. G. Weaver Loper, the president of the Company, states that the Miners' Smelting Furnace Co. has entered into a contract with the Colville M. & S. Co. for the purpose of furnishing the latter corporation two Medberry rotary smelting furnaces. The vendors give a guarantee that, with the character and quantity of fluxes to be used, the Colville Co. is to secure the same results as could be obtained if the ore were shipped to the custom smelters. The guarantee further provides that the returns from the ore smelted shall be equal to those obtainable from the American S. & R. Co. The object of shipping carload lots of ore to distant smelters is to ascertain what results can be had from them and to see that the Miners' Smelting Furnace Co. will live up to its contract.

Republic, December 18.

OKANOGAN COUNTY.

(Special Correspondence).—The Oroville Consolidated Mining Co., operating the Blue Bell group, near Oroville, has discovered rich copper ore on a contact vein, between dolomite and slate, which has been stripped over 100 ft. in length. The ore contains considerable chalcopyrite and some gray copper. There are other veins on the group, but this is the most valuable discovery yet made on the property.——The Conconnully Copper Co. is getting out ore for immediate shipment to the Granby smelter, at Grand Forks, British Columbia, and will increase its working force next month.——The Ruby Mining Co. has decided on building a concentrating mill on its property on the Similkameen river and will ship no more raw ore.——The Golden Chariot mine, on Kruger Mtn., is being unwatered, to take out ore for shipment.——The installation of electric power at the Triune mine is nearly complete and will soon be available for the Kimberley and other neighboring mines in Golden camp.——The Forty-ninth Parallel Mining Co. has started work on a group of claims that were formerly productive of rich copper ore, and expects to begin shipping early next spring, or as soon as railway transportation becomes available. The property is situated between the Kelsey group and international boundary line, on Kruger mountain.

Nighthawk, December 19.

STEVENS COUNTY.

(Special Correspondence).—The First Thought mine is giving employment to 30 men and sending to the smelter 30 tons of ore per day. The working force will be increased as soon as the compressor is installed and power drills can be used. A body of ore richer than any ever before found in the mine was uncovered about a week ago.——It is expected the present contract on the North Star mine will be finished by the end of the month. Some fine ore has been discovered in the new workings. A new adit will be started the first of next year, to be driven 600 ft.——The First Thought Extension Mining Co. is employing six miners sinking a shaft which is down 84 ft., all in ore of good shipping quality and said to assay from $40 to $50 per ton in gold. This company is erecting an assay office, stables, and shaft-houses and will soon begin shipping ore. The vein is apparently from 50 to 200 ft. wide. A cross-cut will be driven as soon as the shaft reaches the 100-ft. level, when the actual width at that point will be determined.——A cross-cut was being driven from the bottom of the shaft, on the 100-ft. level of the Copper Butte mine, on Toulon Mtn., but the work was suspended on account of inconvenience in hoisting. A hoisting plant will be installed immediately, and the shaft will be sunk to the 200-ft. level. Some fine-looking copper-gold ore has been found on the 100-ft. level, upon which a drift will be driven.——Work has been resumed by the British Columbia Copper Co. on the Napoleon mine, above Kettle river, with a force of about 40 men.——In Chewelah district a body of high-grade copper ore, 25 ft. wide, was recently cut while stoping in the United Copper mine, that being the greatest width of the vein, which narrows to six feet in places. The company is employing 25 men, and three teams are hauling ore to the railway, in transit to the smelter. Several more teams will be added, in order to ship all the ore possible while the roads are good. No dead work is being done in the mine at present. The adit on the 400-ft. level is in 1315 ft.——The Blue Bell and Blue Bell No. 2 claims, in the copper belt, three miles from Chewelah, have been sold to A. H. Anderson, of Coeur d'Alene, Idaho, who will place machinery on the ground and begin work on the property. ——The Tungsten King Mining Co., Deer Park district, has refused to bond its property and will continue developing it. In the shaft there is now reported to be nearly 50 in. of solid wolframite. The upper vein is now 34 in. wide, and the one that was uncovered two weeks ago is about 14 in. wide. In the intervening porphyry a new vein is coming in. ——The McKinley Mining Co. has been incorporated with 1,000,000 shares of capital stock at $1 each, of which 400,000 shares have been placed in the treasury. Orient, Washington, is the principal place of business. The incorporators are J. H. Pelky, James D. Grimes, George Weaver, all of Orient, and C. F. Wikstrom, of Spokane, Washington. Mr. Wikstrom, the principal shareholder, will be the president and Mr. Pelkey the superintendent of the company. The company owns nine claims in a group, in Pierre Lake district, 3½ miles northeast of Rockcut. The McKinley No. 1 claim is traversed by a quartz vein 10 to 12 ft. wide, which is traceable a mile and a quarter. It has an open-cut on it which exposes ore that assays $14 in gold and copper. In the open-cut the hanging wall and foot-wall are 34 ft. apart. On the No. 2 and 3 claims open-cuts have been driven across an 8-ft. vein, in one of which is 6 ft. of good ore, assaying $10 in copper, gold, and silver. Some of the ore shows chalcopyrite, cuprite, and bornite and looks rich. The No. 4 claim has an open-cut 8½ ft. deep at the breast and exposes gray quartz. The vein is nearly 8 ft. wide, and a shaft is being sunk on it. On the No. 6 and 7 claims but little work has been done. On the No. 8 is a shaft 82 ft. deep. At 22 ft. below the collar a vein appears dipping at an angle of about 45°. Another vein, 26 in. wide, was cut through at the bottom of the shaft, having similar ore to the one above it. Intervening the two veins the country rock is well mineralized, and average samples assay about $10 per ton in gold, silver, and copper. On the dump of the No. 8 claim are about 60 tons of ore ready to ship. The company will soon equip the shaft with light hoisting machinery, which may be removed from one place to another and be used in prospecting the several veins. The ore will concentrate to advantage. The company will begin shipping late next spring. The company will transact business through the Bank of Colville, at Colville, Stevens county.

Orient, December 17.

Special Correspondence.

MEXICO.

Zinc Mining in Chihuahua.—A Misleading Report. — Absurd Statements.—Some Facts.

Mining men about Chihuahua are more than annoyed by the gullibility of the American Consul at that point and at the ease with which he lent himself to the interests that are fighting against the entry of Mexican zinc ores into the United States free of duty. It seems that there recently appeared in Chihuahua a representative of the Joplin zinc men to gather information that might benefit his clients in their fight before the American Congress. This honorable gentleman represented himself as wanting to buy a zinc property and so sailing under these false colors was presented to a number of operators who had properties for sale and who naturally put the matter to the supposed buyer in the best possible light, as to large bodies of ore, cheap labor and extraction, and simple separation in the case of complex sulphides. With such information as a basis, the said honorable gentleman gets up a report, presents himself to the Consul and apparently having credentials from the United States Government in which the various Consuls are probably asked to lend aid, persuades the Consul to put his name to the paper and send it in to Washington as a Consular Report, and so have it appear as official. No one knowing the Consul at Chihuahua can help but smile at the thought of his sending in such a report, for he probably knows about as much as a child regarding the zinc mining in Chihuahua or elsewhere. The report names some of the principal points in Chihuahua from which zinc is shipped, and then goes on to state that the zinc occurs with lead or lead-silver ores and so partakes of the development of the latter, though some may be called zinc mines, but "in every case, however, silver-lead ores are those sought for and mined." It is further reported that as a conservative estimate there are 1,000,000 tons of zinc ore in reserve, distributed at Picachos, 50,000 tons; Santa Eulalia, 100,000; San Isidro, 100,000; Almoloya, 50,000; and Parral and Santa Barbara, 600,000; with probably more in depth, as with one exception (where the zinc is a by-product) none have yet reached any great depth. And there is one instance cited where the zinc is mined by a tunnel, where the ore is "simply broken down and run through chutes to the mine-car"—almost as good as the *Ladies' Home Journal* story of the little children in Denver going to the creeks with their buckets for gold nuggets as other children would go to the woods for berries. Of the complex sulphide ores it is stated that the zinc in them is no longer a detriment, but is now a profitable by-product because of the simple means of separation available.

This report will receive official endorsement by reason of its having been sent in as a United States Consular Report. A more flagrant misrepresentation of the facts, either due to ignorance or with the direct purpose to deceive, could not readily be conceived. What are the facts? There is scarcely a zinc property in Chihuahua that is not worked wholly for the zinc. The principal one at Picachos has some lead in the vein, but has not yet been able to get a clean enough lead product that would pay to ship, and if there are more than 2000 or 3000 tons of ore in sight no one in Chihuahua knows it except the owner of the property, than whom there are people more reliable. The single deep mine "where zinc is a by-product," is in truth owned by a lead-silver mining company (often spoken of as the greatest in Mexico), but the body of zinc ore is wholly apart from the lead deposits, and is separately developed and mined, and has only the advantage of being exploited under the same organization as the lead mine. The property at San Isidro is known as the largest zinc mine in Mexico, and may be considered as wholly zinc, for after treatment in an expensive mill by a costly dry separation, the lead product amounts to but two or three cars per month—scarcely worth considering. Almoloya may be disregarded; but what of the 600,000 tons of ore in reserve at Parral and Santa Barbara? Of what use is this stock, if there be such an amount? This ore belongs to the complex sulphides that by reason of "simple separation" processes are "not now a detriment," but in connection with which no mention is made of the immense and expensive mill of the Montezuma Lead Co., a monument of failure within sight of Santa Barbara station and representing an outlay of perhaps $1,000,000 or more; of the San Diego, the Alfareña, and the Grenadeña mills, around the hill from the Montezuma, and still problematic after several years of operation; of the San Francisco del Oro and its heavy expenditures on various processes of separation, only to meet with failure and a complete shut-down. The report does not tell that the Tecolotes of the Guggenheim Exploration Co. is the only mill in really successful operation on these complex sulphides in the Parral-Santa Barbara district, and this

Santa Cruz Hill, Parral.

success only after many failures, many shut-downs, expensive alterations; and only by large tonnage does it just barely keep operations on the credit side. Such are the reports being presented to the United States Congress. When the Consul sends in such reports, the State Department should certainly advise the "shoemaker to stick to his last."

PACHUCA, MEXICO.

Real del Monte. — Loreto and Guerrero Mills. — Details of Process.

The Real Del Monte of Pachuca is milling 15,000 tons of ore per month, and shipping 450 tons of high-grade ore. The mill-tonnage is divided equally between the Loreto works, at Pachuca, and the Guerrero, situated below the town of Del Monte. The Loreto receives ore from the Camelia and Barron mines, the Guerrero handling the ore from the San Ignacio, Dificultad, Dolores, and other mines on the Del Monte side. The Loreto treats ore of an average value of ₱55 per ton, and that going to the Guerrero yields ₱30. The process at the two mills is identical. It consists in crushing in cyanide solution, concentrating, tube-mill grinding, and cyaniding in slime-tanks. At the Loreto the concentrate amounts to 248 tons per month, the gross value of which is ₱487 per ton; at the Guerrero the output is 219

tons per month, assaying ₱405. The average of the ores received at the Loreto is 1 kg. 250 gm. silver and 5 gm. gold per ton, and 4% iron; the concentrate shows 30% iron, 10% zinc, and 0.3% copper. The copper, and a small percentage of manganese, are mostly taken out by concentration. The 40 stamps at the Loreto crush 120 tons per 24 hr. through 40-mesh screen, a weak cyanide solution being used in the batteries; the 14 Chilean mills, of the old Pachuca type, running 14 rev. per min., crush 220 tons of crude ore per day. The pulp from the stamps and Chilean mills passes to 37 Johnson vanners, the tailing from the latter going to Dorr classifiers. The sand taken up by these classifiers is ground to 200 mesh in tube-mills, and is then drawn into agitating tanks with the slime that comes direct from the Dorr classifiers. Of the four tube-mills, one is a Krupp, two are Abbes, and one is made by the Denver Engineering Works. It is an all-slime process after the material leaves the vanners, 90% of the slime in the agitating tanks being 200 mesh. The agitation period is 36 hr., the first treatment being with a 0.15% solution, which is raised to 0.20 by the addition of fresh KCy. The solution, after agitation, is decanted, and the tank filled with a second treatment-solution carrying 0.15%, and again agitated. There are 27 of these agitating tanks. Each charge is given three to five treatments, according to the character of the ore. The decanted solutions are all passed direct to the precipitation boxes, and the flocculent slime is pumped to Butters filters, the total extraction of the gold and silver being 85 per cent.

The Guerrero mill is supplie with ore by an aerial tramway, 6000 ft. long, from the San Ignacio, Difficultad, and Dolores mines; and by a surface tramway from the Escoban and Cobrara mines. The mill-bin has a capacity of 2000 tons, with 10 pockets by which the ore from different mines is kept separate prior to sampling, after which it is mixed. There are 40 stamps, each weighing 1050 lb., having a 6-in. drop, 106 per minute. The mortars are of the El Oro design, with narrow discharge and wide base, set on concrete foundations. The screens are of No. 19 wire, set to give 2½-in. height of discharge. The batteries are now crushing 7½ tons per stamp per 24 hr. The pulp from the stamps is elevated to 6-ft. cones, the overflow passing to thickening cones, the thickened slime from the latter going to Johnson vanners; the underflow from the first cones discharges upon two Callow screens having 40-mesh No. 36 steel wire cloth, traveling 100 ft. per minute, effecting a very clean separation at 60-mesh as the divisional size. The oversize from the Callow screens is re-ground in Evans-Waddell Chilean mills, running 30 rev. per min.; the undersize is classified in hydraulic cones and passed to Wilfley tables and Johnson vanners. The table tailing resulting from the concentration of the coarse sand joins the oversize from the Callow screens as it passes to the Chilean mills; the latter are fitted with diagonally punched screens having a width of opening of 0.018 in. From these mills the pulp is delivered to classifying cones, the coarse material passing to Wilfley tables for re-concentration, and the tailing being returned to the Chilean mills for further re-grinding; the fine slime from the above classifiers is sent to Johnson vanners. All material coarser than 80-mesh is returned to Wilfley tables, and the tailing from the latter to Chilean mills for re-grinding. All slime from the above process is thickened in 14 Callow cones, 8 ft. diam., before it passes to the vanners. The vanner tailing goes to Dorr classifiers, the slime passing to the agitating tanks, and the sand to tube-mills. Of these, three are of the trunnion type made by Abbe, and one is a Denver Engineering Works mill, with corrugated iron lining. The discharges from the tube-mills are elevated to Dorr classifiers, the slime from the latter being sent to the cyanide tanks, and the sand returned to the tube-mills for re-grinding. At this plant the first agitation is 24 hr. in a 0.2% cyanide solution; the second wash takes 8 hr., with a 0.15% solution. During the second wash is added 250 gm. lead acetate for each ton of dry slime. The first and second washes are metal-bearing solutions; in the third, fourth, and fifth washes a barren solution is used. The slime solution carrying the silver and gold is then pumped to a Butters filter of 96 leaves; and after the solution is drawn off to the zinc-boxes a water-wash is given that passes through to the battery solution. The consumption of cyanide per ton of dry slime is 1.1 kg. (2.42 lb.). The zinc consumption is 512 gm. (1.26 lb.) per ton of dry ore crushed, and 1 kg. 128 gm. (2.48 lb.) per kg. of bullion produced.

BUTTE, MONTANA.

Minnie Healey Development.—Large Surface Plant.—High Ore.—Berkeley and Gagnon Hoisting Works.

The Butte Coalition Co. has begun the use of the new Tramway shaft and hoist for mining operation in the Minnie Healey and a portion of the Rarus mine. The Tramway vein will also be mined through the new shaft. The shaft is something more than 1600 ft. deep, and will be sunk deeper while mining progresses on levels 13, 14, and 15. Level 16 is being opened from the Tramway through Tramway ground and into the Minnie Healey. With the operation of the new hoist the output of the company, which is now from 1000 to 1200 tons of ore per day, will be increased gradually until, a few months hence, at least 2500 tons will be hoisted daily. The new surface plant at the Tramway is one of the largest and best in the Butte district, and was designed to serve largely for all the operations in the Rarus-Minnie Healey group of mines, including the Tramway and Snohomish mines, in which the Coalition owns controlling interests. The new engine, made by Allis-Chalmers, is a Corliss type, with 32 by 72 in. cylinders, capable of hoisting the seven-ton skip from a depth of 3500 ft. It is equipped with drums 12 ft. diam., on which are wound 1½ in. diam. steel ropes. The plant includes a large boiler house with equipment, carpenter shop, hoisting-engine building, miners' change-house sanitarily constructed, with hot and cold water and shower baths, capable of accommodating 1500 miners; machine shops, warehouse, and office building. The steel head-frame is 92 ft. high to the sheaves. In addition to the large hoisting engine, another engine of good size is in use for sinking and lowering supplies and handling the men, through the third compartment of the shaft. Excellent results have been obtained by the developments on the lower levels. They have practically made a new mine out of the Minnie Healey. Level 13 is 60 ft. below the lowest mine of the old workings on the 1100-ft. level. That 60 ft. of ground will be left as a barrier against the fire and gas from the upper levels. The vein is said to be more than 35 ft. wide, but more than a dozen other veins of varying sizes have been opened on level 13, the smallest being about 4 ft. wide and very high in grade. Similar conditions prevail on level 14. On the 1500-ft. level the largest vein opened is more than 50 ft. wide, and 35 ft. of it is rich. Another vein is 25 ft. wide and carries considerable copper glance. On level 16 in the Tramway vein is more than 30 ft. of good commercial ore.

New change-houses have been built at the High Ore, Berkeley, and Gagnon mines. New ore-bins have been built at the West Colusa, and a new boiler plant installed at the Berkeley. A new electric hoisting engine has been put in at the West Gray Rock. A new compressor has been installed at the Leonard, as well as new machine shops, carpenter shop, etc. The big hoisting engine at the Bell mine has been transferred to the Little Mina, the Bell being operated through the Diamond shaft. The new hoisting engine at the Pennsylvania mine, lately installed, is similar to that at the Tramway; it is of the same make and capacity. A new boiler plant has also been put in at the Pennsylvania, a new steel head-frame erected, and new skips installed.

During the present year the Gagnon shaft has been deepened 200 ft., its present depth being 2300. The Diamond, which is down 2200 ft., is also being sunk deeper, as are the Leonard and Little Mina. The North Butte Co. sank the Speculator shaft 400 ft. farther, and sinking is in progress at the Rarus, the Tramway of the Coalition Co., and the Original, Poser, and Elm Orlu of the Original Company.

JOHANNESBURG, TRANSVAAL.

Failure of the Gordon Drill. — Rhodesian Labor Bureau. — Premier Diamond Company.—Profitable Tin Mine. — Gold Production of Central Rand.

In a recent communication, reference was made to the disappointing results obtained in actual working practice by the Gordon drill, which won with such remarkable ease in the trial last January. The urgent need of an efficient light drill, hammer or percussion, to displace native hammer-boys in stopes of narrow width, and the admirable performance of the Gordon under trial conditions, make this failure particularly deplorable, though the last effort to produce an economical hammer-machine has by no means been made. A lawsuit is now proceeding in connection with the Gordon Drill Co. (too complicated for brief report and still *sub judice*), in the course of which several interesting opinions have been given by miners, called to the witness-box to state their experience with the drill. The foremost trouble has been, it is stated unanimously, with the anvil-blocks, which have lasted a few minutes or a few hours, rarely over a day or two. If soft, these blocks 'swell'; if hard, they break. Repairs have consequently been a prohibitively heavy charge (about £20 per machine per month) and have placed the drills out of use for an excessive proportion of the normal running time. The ratchet arrangement for rotation has also been a source of trouble, owing to the teeth being too fine. When the anvil-blocks break, damage may frequently be occasioned to other parts before the fracture is discovered and the drill can be stopped, the blows of the little hammer being so rapid. While the principle of the Gordon drill may yet be turned to good account by a strengthening of construction, the supporters of light percussion stope-drills have been encouraged in the belief that they are working on the best lines. The experience of the last year has clearly demonstrated that the process of stope-drill manufacture on novel lines is one better befitting the energies of a well financed company than of the 'practical man' and that an outlay of a few hundred pounds is of small avail for the accomplishment of final results.

All applications from America for entry in the forthcoming stope-drill contest should have been despatched, for the list closes on December 31. The many communications received from the States by the Committee inspire the hope that many new ideas will be brought to public notice by American manufacturers. Similar complaints to those heard a few years ago against the Witwatersrand Native Labour Association, expressed by those believing that better results could be obtained from open recruiting, have recently been voiced by a group of Rhodesian operators against the Native Labour Bureau of that territory. Naturally the trouble has arisen in a period of shortage, when dissatisfaction is easily kindled. The Bureau was formed to establish co-operation in place of competition among employers of native labor, and any effort to break up the institution would surely be economically disastrous, even though independent recruiting might be advantageous to a few at the moment. The present 'opposition' comprises a number of small operators in the Hartley district.

South African diamond companies are rarely talkative. Liberal permission is granted visitors to inspect the mines and plants, but questions of policy and results receive only brief mention upon the issue of annual reports or at general meetings. During the recent period of acute depression in the diamond market, directors have been particularly reticent, preferring to risk unchecked chatter than official publicity, which might weaken their hands in the battle of commercial competition. On this account, the statement published by the Premier Diamond Co. as to the results obtained during the half-year ended October 31 has proved of signal interest, and demonstrates the pluck with which a vigorous technical policy has been pursued in face of external difficulties. The salient features of the report are the cost reduction and the maintenance of output. During the last five years returns have been:

Year to Oct. 31.	Loads Washed.	Carats Yielded.	Carat per Load.
1903	76,931	99,208	1.29
1904	939,265	749,643	0.798
1905	1,388,671	845,652	0.609
1906	2,988,471	899,746	0.301
1907	6,538,669	1,889,937	0.289
1908	8,145,794	2,078,825	0.25

A load is 16 cubic feet.

Total costs per load have been reduced from 2s. 4d. in 1907 to 1s. 9d. Values have not yet been announced.

It is indeed gratifying to observe from a report issued by the Eckstein concern, the Transvaal Consolidated Land & Exploration Co., that at least one profitable lode-tin mine has been established in the country as the result of the extensive and often financially disastrous prospecting done in recent years. Stream tin was found on their farm Groenfontein in the Waterberg district (north of Pretoria) in 1906, and subsequently a rich deposit was discovered in place. A larger plant has been erected and shortly 3000 tons will be treated per month, as compared to the 1000 tons for which the plant was originally designed. Good profits have already been recorded, and during the five months ended August 31, 4267 tons were crushed, for a yield of 418 tons of concentrate, containing 70.6% metallic tin, and valued at £32,260. Of this amount £13,695 was absorbed by working expenditure, leaving £18,295 as profit. These figures are the first that have been available in regard to a profit-making tin-mine in the Transvaal. The directors state that the fuller knowledge of the nature of this Groenfontein deposit leads to the belief that not only will the rich lenses prove to be more persistent than anticipated, but that there is a probability of large bodies of low-grade ore being discovered. The alluvium may also be worked profitably. The chief Groenfontein deposit comprises a lenticular mass of coarse graphic granite, partly impregnated with cassiterite, which replaces feldspar and sometimes even quartz.

Questions relating to the claims of various gold mines for pre-eminence or to goldfields for the distinction of foremost richness are ever of lively interest. As a rule, a diversity of conditions renders close comparisons difficult to establish. Without, therefore, attempting contrasts, we may ascertain what the richer (central) section of the Rand is now doing. The central section may be taken to comprise 15 mines (out of 63) and to cover four miles along the strike. Taken in order from west to east, these producers recorded the following returns for September:

	Tons.	Yield.	Profit.
Langlaagte	48,560	£ 63,499	£ 24,290
Langlaagte Deep	40,338	52,345	18,128
Crown Reef	24,500	39,109	20,000
Crown Deep	38,865	67,883	39,011
Robinson	44,700	111,341	84,489
Robinson Central Deep.	30,378	66,617	45,333
Robinson Deep	54,977	94,189	51,939
Ferreira	24,100	57,085	35,038
Ferreira Deep	33,000	77,555	50,008
Village Main	42,100	63,996	29,081
Village Deep	29,100	39,134	12,026
Salisbury	7,650	8,716	2,912
Jubilee	5,236	7,034	2,332
City & Suburban	25,800	27,360	8,005
Meyer & Charlton	13,126	19,816	8,052
Total for four miles..	462,430	£ 795,679	£ 430,644
Total for Rand.....	1,534,755	£2,401,831	£1,025,362

This small section is seen, therefore, to account for over two-fifths of the Rand's entire profits. Its gold-producing capacity may be placed roughly at £2,400,000 per mile per annum, and its profits at nearly £1,300,000 per mile. The inclusion of the old Jubilee and Salisbury mines—small properties standing aloof from amalgamations—provides a striking reminder of the humble standards obtaining in the early days of Johannesburg's development.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

'Make of stone' is the Australian equivalent of ore-shoot or orebody.

The largest Sequoia, or 'big tree', as it is sometimes called, is said to be 325 ft. high, with a maximum diameter of 35 feet.

The specific gravity of storage battery cells should never be adjusted until the cause of the change is found and remedied.

Arkose is the name applied to a variety of sandstone containing a large amount of feldspar grains. It usually shows mica and many other silicates, indicating that it originated from the erosion of granitic rocks. A large number of sandstones are in reality arkose.

Hand-sampling of ore fed to a mill, and of the products at various stages in the milling process, is liable to gross error, even when conscientiously done. Automatic sampling should always be adopted. In designing a mill ample grade should be allowed for that purpose, a detail commonly neglected.

Machines with reciprocating motion should be driven by an adjustable speed, compound-wound motor. The latter feature is specially useful, in that at the instant of reversal of the machine-tool, when the torque required of the motor increases above the normal, since it assists materially in holding the in-rush of current within reasonable limits. A fly-wheel also assists in such a case.

Obstinate sulphation of storage battery cells may be remedied by removing the electrolyte and replacing with water. Allow it to stand for two or three hours. If the specific gravity is below 1.060, add electrolyte to bring it to about that figure, and if too high, add water. Charge the cell at the normal rate for eight hours after the density and voltage cease to rise.

The properties of copper wire, according to the Brown & Sharpe gauge, may be conveniently carried in the mind with the help of the following hints. A wire which is three sizes larger than another wire has half the resistance, twice the weight, and twice the area. A wire which is ten sizes larger than another wire has one-tenth the resistance, ten times the weight, and ten times the area. No. 10 wire is 0.10 in. diam.; it has an area of 10,000 circular mills; it has a resistance of 1 ohm per 1000 ft. at 20° C., and weighs 32 lb. per 1000 feet.

Copper ores of low metallic content are being developed extensively in many places. The great mines of the Utah Copper and Boston Consolidated Mines in Bingham canyon, Utah, produce ores that will not average above 1.7% copper, and the disseminated ores of Ely, Nevada, constituting the basis for the operations of the Nevada Consolidated, will average but little higher than 2%. It is well for prospectors to examine the surrounding crystalline rocks on seeing indications of copper. It may happen that the country is more valuable than the small, though more highly enriched, veins that traverse it.

Stadia measurements are now accepted by the U. S. Land Office for the determination of distances in the survey of claims for patent. Such a ruling has been in force in the neighborhood of three years. The stadia is designed to secure rapidity rather than accuracy; but on particularly rough country, using especial care in the field and extra refinements in the reduction of observations, it should exceed the tape-line in accuracy of results. The degree of precision is dependent upon the magnifying power of the telescope, the length of sight, and the ratio of the space on the rod to the corresponding space on the ground.

The Italian method of tunneling is essentially a treacherous-soil method. It consists in excavating the bottom half of the section by means of several successive drifts and building the invert and side-walls; the space is then re-filled and the upper half of the tunnel-section is excavated and the remainder of the side-walls and the roof-arch are built; finally, the earth-filling in the lower half of the section is re-excavated and the tunnel completed. The method is an expensive one, but it has proved remarkably successful in treacherous soils. It was first used in driving the Cristina tunnel, on the Foggia & Benevento railroad, in Italy.

The United States Land Office does not, nor did it ever, prescribe that solar observations should be used in determining the true meridian for patent surveys of mining claims. The U. S. Surveyor General, at San Francisco, informs us that such is the case, and that, as a matter of fact, the majority of applications passing through his office are based upon surveys in which stellar observations have been used. The usual limit of accuracy attained in patent surveys, using the direct solar observations, is probably within three minutes. Of the three common methods, stellar, direct observation, and solar attachment rank in accuracy in the order in which they are named.

Jamesonite is the sulph-antimonide of lead ($Pb_2Sb_2S_5$), containing 50.8% lead and 29.5% antimony. On account of its occurrence in masses of hair-like crystals, it is also known as 'feather ore.' It is gray in color, with a steely lustre. Large deposits are rare; in fact, it never constitutes a commercially important ore, although it is often present in notable amount with galena, stibnite also being present. Antimonial lead ores are not in demand, and at the present time the antimony market is exceedingly dull. Under exceptionally favorable conditions a large deposit of jamesonite, free from arsenic, would enable its owner to control the American market for antimony.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Dredging on the Seward Peninsula.

The Editor:

Sir—I have read the article by T. A. Rickard entitled 'Dredging on the Seward Peninsula,' in your issue of November 28, in which is a severe flaying of the affairs of the Nome Mining Co. Though I must confess the criticisms, in general, are fully warranted, I wish to correct certain imputations concerning the management during the past season, as also certain statements that are by no means based on facts or research.

If the writer of this article had been conscientious or charitable enough, during his visit of perhaps 10 minutes on the dredge, to have inquired of the manager his connection with the enterprise, or given him a chance to explain certain questionable things, he would have secured some knowledge which might in a way mitigate the severity of certain caustic remarks.

My connection with the Nome Mining Co. covered a period from the middle of June to the early part of September of this year (the dredge sank on August 14) and nearly a month of this time was taken up in getting the dredge in shape to launch. When I started for Alaska it was with the understanding that the dredge and power-house were in shape to run, with the exception of a few days for making the necessary adjustments. I was also informed that the contractor would bring his own crew and make the usual 30-day test-run. In addition, it was understood that all accounts for labor, etc., were taken care of, so that my early connection with the project naturally seemed very auspicious. This information had its origin in the owner and former manager of the property, and you can appreciate my disappointment on arriving in Nome to find conditions altogether different. The dredge and power-house were not nearly completed, and some material, supposed to be on the ground, had not arrived. It was also ascertained that certain very necessary apparatus had not been ordered at all, making it obligatory to borrow material that, in some cases, was not suitable, and also resort to make-shift parts until proper stuff could be ordered.

In the meantime, I learned that the contractor, previous to his arrival this summer, had been paid in full for his dredge, and the men were looking to me for their transportation from the States, as well as for the labor account. The 30-day test was a myth, and after a short time I saw little of the contractor. My first impression naturally was to accept defeat, and retire from the field. Thinking, however, that the crew brought into the country by the contractor would be of the best material from California (some of these men came from Oroville), I planned to go ahead and take chances. Assuming the manager wholly inexperienced, as the writer of this article claims, was he not excused from going to Oroville or Marysville to secure a capable dredge-master, and under these conditions should he be so unsparing as to discharge these men and seek others, without evidence of their incapacity? There was a dredge-master in charge of the boat, and though he was a man we could depend on, he was not a mechanic, and as the electrician in charge of the power-house showed greater ability in this line, I naturally had him look after the general details concerning the dredge. I wish to emphatically state that no one connected with the work at Nome this summer had anything to do with the designing of the dredge or power-house, except in the manner of strengthening—by braces, and other means—many weak parts of the machine.

Regarding the dam: when everything was ready for launching I was informed by the contractor that there would be required 4½ ft. of water to float the dredge. A suitable dam was constructed, but owing to the very dry season, which prevailed during the early summer throughout Alaska, it was difficult to get even the supposed necessary amount of water. It is not surprising then that the original dam was somewhat low when it was ascertained later that the dredge had a draft forward of nearly 6 feet.

This dredge was originally designed as an open-chain type, having 33 buckets and a like number of links. For some reason, the former manager induced the contractor to put on a closed-bucket line. This digging portion of the machine weighed 105 tons. The dredge was unquestionably not suitable, but as the contractor had no money there was very little satisfaction in looking to him for compensation or redress. It was up to me to go ahead.

In regard to the drilling of the property, I can say that it was all done before my connection with the company, and the records were in such shape that I considered them, in the main, unreliable. It is common sense and a well known fact that ground, considered for mining purposes, should be thoroughly drilled or otherwise explored before commencing mining operations, and the writer of the article should know from his professional experience that it would be absolutely impossible to verify the drilling and correct all the mistakes in the short time I had been on the ground. As long as the dredge was there, my hope lay in the machine at least proving the ground and showing results which would induce my people to properly drill the remaining holdings, and take means to correct the errors that were so apparent.

I wish to state that the writer of this letter is a graduate of a reputable mining school, has been employed for 17 years by people connected with the greatest mining enterprises of this, or any other country, and if the author of the article in question cares, or will take pains to inquire from some of the principals connected with these enterprises, regarding the writer's standing, he will no doubt ascertain whether he would be considered capable of managing the affairs of a dredging concern.

In writing a paper like the one under discussion, based, evidently, largely on information obtained from irresponsible persons, the author descends to the plane of the ordinary mining reporter of our local papers. I know of no code of professional ethics which would commend the unwarranted and cynical criticism of Mr. Rickard's article.

W. W. J. Croze.

Duluth, December 7.

[We are glad to give Mr. Croze an opportunity to defend himself; we are not surprised at his annoyance. In explaining some of the causes of the disaster to the Bourbon Creek dredge, he thinks it necessary to attack his critic; this also is natural. But he is in error in regard to the manner in which the information was obtained; the author of the article made not one visit of 10 minutes, but three different visits aggregating two hours, at least, and these visits to the dredge were supplemented by lengthy conversations with Dr. Cabell Whitehead, one of the directors, besides an interview with Mr. E. L. Smith, the constructing engineer, and others likely to know the facts. To Mr. Croze the author of the article was introduced as the editor of a technical journal in search of reliable information concerning the local mining industry, and if he was so unwise as not to use the opportunity to explain the disastrous condition of the dredge, it was not the fault of the author, who questioned him courteously on several other matters. Mr. Croze made the mistake of taking charge of a mining operation for which his previous experience afforded no preparation; he was the victim of circumstances some of which were beyond his control and some beyond his ken. While regretting to have hurt the feelings of any man, the author of the article thought it well to emphasize the blunders made by the Nome Mining Co. upon its Bourbon Creek dredge so that others might be warned from sharing the misadventures of Mr. Croze and his directors.—Editor.]

Eucalyptus for Mine Timbers.

The Editor:

Sir—The recent discussion in your paper on the value of eucalyptus for mine timbers by Messrs. A. H. Martin and T. L. Carter is of particular interest to me, and it should be interesting to everyone engaged in mining. Having made a special study of the eucalyptus, with reference to its suitability for railroad ties and bridge timbers, where hardness, strength, and durability are wanted, I feel that Mr. Carter's letter should not go unanswered. The mining industry is as much concerned in the future supply of timber as the railroads. I agree with Mr. Martin's statements, with a few exceptions.

The woods of the eucalyptus are heavy, only a few species floating in water. According to McClatchie, there are 22 species cultivated in the United States that are suitable for railroad ties and underground work. Selection of species with reference to use as timber must be considered in relation to soil and climatic requirements.

To the average person, the term 'eucalyptus' has meant nothing but the most widely planted species, *Eucalyptus globulus*, or 'blue gum'. In Australia several species are known as 'blue gums' and several as 'red gums'; and the same species may be designated by several different common names. Australian common names that have been generally adopted in America are 'blue gum tree' for *Eucalyptus globulus*, and 'red gum tree' for *Eucalyptus rostrata* and several other species indiscriminately. The entire genus *Eucalyptus* should not be condemned because the wood of one species, according to Mr. Carter, has been found inferior to other timbers for mining purposes. The principal drawback to eucalyptus timber has been its tendency to check, or open fissures and shakes, and its hardness, with consequent difficulty in spiking and working. The better understanding of methods for seasoning and handling this timber is doing much for its advancement. Mr. Carter has considered only *Eucalyptus globulus*, and has hardly given that widely known species its due. Its timber is hard, heavy, strong, and fairly durable. In America, however, it is not considered equal in timber properties to the ironbarks, to the sugar gum, or to the red gums. Its fast-growing characteristic has been its chief claim for prominence, and has led to planting in different parts of the Southwest for windbreaks and fuel.

For mine-timbering there are other species that are superior to the blue gum. There are about 17 species of eucalyptus that could be grown by mining companies and would furnish satisfactory material for timbering. According to the report of the State Board of Forestry, blue and sugar gum timber have been used with success in timbering mines near Escondido that are flooded during a part of each year.

The sugar gum (*Eucalyptus corynocalyx*), the red gum (*Eucalyptus rostrata*), and the narrow-leaved ironbark (*Eucalyptus crebra*) are eucalypts that should recommend themselves to the mining industry. The durability, hardness, and strength of the timber obtained from these species make them eminently fit for the mines. The sugar gum furnishes a wood that is very durable as railway ties, as posts, and for underground use. Baron von Mueller states that posts set in the ground 15 years showed no signs of decay. The wood warps but little in drying, and when dry is very hard. In the interior valleys of southern California and Arizona it withstands both the intense heat of summer and the frost of winter. For desert country this is one of the most eligible among timber eucalypts. It does not grow quite as rapidly as the blue gum, but furnishes a more valuable timber. In New South Wales the ironbark is considered the king of hardwoods. The narrow-leaved ironbark endures a greater variety of climatic conditions than do other ironbarks. At Fresno, California, it grows vigorously, and young trees have grown well near Phoenix, Arizona. It is said to be content with poor soil, and, judging by experience with it thus far, it ought to grow in most valley and hillside situations in the Southwest.

An important point in considering the value of commercial plantations of eucalyptus has been deter-

mined by the United States Forest Service, from strength tests made by them, namely, that the fastest growing species are also the strongest. The bending tests showed the modulus of rupture in pounds per square inch to be:

	Age in Years.	Pounds.
Sugar gum	15	25,344
Blue gum	30	23,265
Blue gum	15	16,900
Red gum	15	14,380

The crushing strength in pounds per square inch, the compression being parallel to the grain, was:

	Age in Years.	Pounds.
Sugar gum	15	11,290
Blue gum	30	12,310
Blue gum	15	8,190
Red gum	15	7,723

The crushing strength of some American woods, in pounds per square inch (from Kidder):

	Pounds.
Oregon pine	4,500
California redwood	3,000
White pine	3,500
White oak	4,000

Comparison with Forest Service tests on hickory shows that 30-year blue gum is stronger than XXX hickory, and that 15-year sugar gum is nearly as strong as second-growth hickory. These tests would seem to disprove Mr. Carter's statement that the blue gum wood is of poor quality, and not strong enough for props in heavy ground. Perhaps the timber was not properly seasoned, or from immature trees. We see from the above tests the difference in strength between 15 and 30-year blue gums.

I believe mining companies would do well to plant eucalyptus for their future supply of mine timbers, not necessarily at the mine, but in the nearest locality available for a commercial plantation. A careful selection of species suitable for this work and a thorough investigation of local climatic conditions, by someone familiar with the requirements and cultivation of eucalyptus, may save money and avoid failures.

LESLIE W. SYMMES.

San Francisco, December 7.

Dredging on the Seward Peninsula.

The Editor:

Sir—The article in your issue of November 28, entitled 'Dredging on the Seward Peninsula,' recalls certain facts in connection with the construction of the Three Friends dredge on the Solomon river.

The contract for this dredge was not let until toward the end of December 1904. The machinery was furnished by the Bucyrus company of Milwaukee, while the hull was built and the machinery installed by the Western Engineering & Construction Co. of this city. The plan followed by the contractors was as follows: All the lumber used in the construction of the hull, and for the support of machinery, was framed and made ready, as far as possible, for placing in position, before being shipped north. While this work was being carried forward at Seattle, the machinery, supplies, and everything else necessary for a complete dredge were being assembled at that port. In the early part of June 1905 the entire outfit was loaded on one vessel and started on its long journey to the Solomon river. The framing of timbers, assembling of machinery, together with the equipment and loading, were under the personal supervision of D. P. Cameron and E. E. McCarthy, the latter now in charge of the dredges of the Yukon Gold Co. at Dawson. Both men were then connected with the Western Engineering company. The construction crew, composed of men experienced in dredge-building, went north on the steamer that carried the lumber and machinery. McCarthy was in command of the party and superintended the construction. The plan of "putting all your eggs in one basket" was a good one, for it insured having everything necessary for the work at hand, as needed. It was not all plain sailing, however, for shortly after the cargo had been unloaded on the exposed shore, near the mouth of the river, one of the storms for which Bering Sea is noted arose, and in a few hours the beach for several miles was strewn with dredge-timbers, while some of the machinery was buried in sand cast up by the waves. Undaunted by this misfortune, W. L. Leland, one of the owners, assisted by the construction crew, re-assembled all the parts and materials, and by working night and day the dredge was completed so that digging operations commenced early in September. A successful run lasting 35 days was made, when the advent of cold weather forced a suspension of operations. It was found that everything necessary for the work had been provided, and to this, and to the energy and ability of those in charge of the work, can be attributed the success of the undertaking. It must be a source of great satisfaction to those who accomplished this task, to know that the dredge has 'made good.' The experience of the Three Friends company affords ample proof that a modern gold dredge can be constructed expeditiously and operated profitably in the far north when the management is what it should be.

R. F. LEWIS.

San Francisco, December 12.

[This is an interesting note and we are glad to publish it. Of Mr. McCarthy's energetic work we have heard from Dawson and from Nome. He deserves credit; so does Mr. Cameron. Another item of credit remains to be allocated: we refer to the Bucyrus company. The author of the article containing the description of the Three Friends dredge wrote with approval, indeed with enthusiasm, concerning the good sense and skill exhibited in this dredging enterprise and he pointed to it as a model. At the time of writing the article he did not know who manufactured the machinery, although he had noticed the excellence of it. But now that the matter has been mentioned, the author is only too happy to state that the Bucyrus company supplied the machinery on the Three Friends dredge and, what is more, their delivery of that machinery was so prompt and so complete as to have been an important factor in expediting the construction.—EDITOR.]

CALUMET & HECLA COSTS.—II.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

The Buffalo smelter of the Calumet & Hecla Mining Co. receives No. 1 and No. 2 C. & H. 'mineral' and anodes from the smelter at Hubbell, anodes from the Quincy smelter at Hancock, and Adventure anodes made at the same place. Anodes weigh 400 lb. each and are of 2 in. average thickness. They are set with stripping-sheets to start the cathodes, the cathodes being withdrawn when the anode is half dissolved and a fresh stripping-sheet inserted to take the rest of it. In other words, the cathodes are twice drawn for each anode.

The cathodes have a conductivity of 101.5%, Mathiessen standard, and will be found to contain 99.98% copper. The electrolytic works at Buffalo cost $200,000.

The No. 1 mineral shipped to Buffalo is melted in charges of 40,000 and 100,000 lb. with 23 to 60% cathodes, to give a product of refined copper having an average conductivity of 100%. The following shows the quantities of No. 1 refined copper and of electrolytic thus combined:

	Mineral.	Anodes.	Refined Copper.
Three months, 1905-06..	9,246,329	4,953,782	14,226,501
Three months, 1906-07..	5,713,549	4,962,765	10,676,104
	14,959,878	9,916,547	24,902,602

About one half of the product of the Calumet & Hecla is treated at the Buffalo works, and it may be inferred that the charges will contain on an average 40% of anodes for that period. It will be seen that some twenty million pounds of copper was produced annually as anodes, the output being very regular, while the quantity of No. 1 mineral is variable; during the period 1905-06 the proportion of anodes was but 35% of the total charge. At this time the quantity of 'mineral' was larger than at the second period (1906-07), and the excess was added to the larger furnace (No. 4), where the proportion of anodes was but 23%. The percentage varied greatly at times, apparently according to the supply immediately available; three charges contained mineral only, and had a conductivity of 99.3%; six charges consisted of cathodes only and had an average conductivity of 101.5%. Of the last, four were made into wire-bars.

The output of the Hubbell smelter for the fiscal year 1906-07 may be given at 72,000,000 lb.; that of the Buffalo works from No. 1 mineral of 80% copper at 20,000,000 lb. of refined product.

In reference to the slag from this product sent to the cupola to be made into blocks, its quantity must have been small, and it would naturally be put into a reverberatory furnace on Saturday, allowed to stand over Sunday, and thus by the continuous treatment eliminate the arsenic. The products of the three furnaces are marked C. & H., and are put on the market at the same price as the output of the Hubbell smelter.

The conductivity tests go to show the uniform excellence of the product of the Buffalo works, almost all being such that it could be used for wire-bars. The minimum was 98.95% in one instance, the highest 101.9. Besides the anodes made from the No. 2 mineral at the Hubbell works, anodes from the Quincy and from the Adventure mines are treated.

For the year ending April 30, 1906, the total 'mineral' treated at the Hubbell works was 46,000 tons; the expenses being as follows:

Total smelter expenses	$355,642
For new construction	22,290
Leaving for operating expense	$333,351

Which, on 46,000 tons, figures $7.23 per ton.

The total mineral treated in the year ending April 30, 1907, was 43,000 tons; the total expenses for so doing being as follows:

Total smelter-expenses	$462,000
For new construction	156,000
Leaving for operating expense	$306,000

Which, on 43,000 tons, equals $6.9578 per ton of mineral smelted. The figure per ton of refined copper was $11.78, so that the average of the mineral was 59% copper.

The items of operating expense are:

Supplies, including ladles, brick, fire-tools, iron and steel, coal, coke, sand, limestone, poles, etc.

Labor, including all engaged in the actual smelting and outside hands about the yard.

Laboratory expense.

Machine-shop expense.

General expense, including salaries of superintendent, office-men, but no portion of the expenses of the Boston office.

Repairs for existing plant.

Taxes.

No allowance was made in the above for depreciation, interest, or insurance (the company assuming its own risk on the latter), nor for new construction.

On the basis of the figures given above we may estimate the silver recovered from No. 2 C. & H. mineral at 100,000 to 140,000 oz., worth, at 60 cents per ounce, $60,000 to $84,000.

The costs at the C. & H. works at Buffalo for treating anodes, including the re-melting of the cathodes produced, is given at $8.497 per ton of refined copper. This includes, besides prime costs, general expenses and the cost of recovering and marketing the silver contained in the anodes. The value of this silver, which may be variously estimated at from 10 to 14 oz. per ton of cathodes, is, at the highest price, in 1906, sufficient to meet the above-named expense of electrolytic treatment.

The cost of re-melting was stated at $4 per ton, leaving $4.50 per ton for electrolytic refining proper.

The freight on mineral from the mill at Lake Linden to Buffalo is 85 cents per ton.

We may compute the expense of treating No. 2 mineral of 20% copper as follows, per pound of copper obtained:

Reverbatory melting of No. 2 mineral	$ 7.10
Smelting slag to produce cupola blocks	4.24
400 lb. copper at 28.35c.	$11.34

We have accordingly the costs per pound of copper:

	Cents.
Producing cupola blocks	2.835
Re-melting cupola blocks, $4 per ton	0.200
Shipment to Buffalo, 85c. per ton	0.041
Electrolytic refining, $8.50 per ton	0.450
Costs per pound of copper	3.526

From the testimony brought out in the litigation, we obtain the following comparative selling expenses and prices obtained per pound for copper by the respective companies in the year 1906:

	Calumet & Hecla.	Osceola.
Pounds produced	100,517,756	18,588,451
Expense at Boston	Not given	$ 29,582
Selling expenses	$457,243	$108,712
Smelting expenses, cents per pound	0.589	0.545
Selling expenses, cents per pound	0.455	0.585
Net price, cents per pound	21.77	21.59

In the testimony against the Calumet & Hecla Mining Co. it appears that some 10,000 short tons of copper are treated by electrolysis that contain 10 to 14 oz. silver per ton, that is, 100,000 to 140,000 oz. silver, worth $50,000 to $70,000. No mention of this asset or product of the company is made in its annual report. The same practice is followed by other companies producing Lake copper. Formerly, before the time of electrolytic refining, this could be justified because the silver could not be then profitably recovered. Even now, unless the copper contains 25 to 30 oz. silver, it is supposed only to pay for its removal. With silver worth 60c. per ounce, 10 to 14 oz. silver in the anode-copper would repay the cost of refining by electrolysis, and all over this should be a profit, and should be specified in the annual report. Incidently, such refining greatly improves the quality of casting copper or of blister copper to bring it on a par with the best of Lake copper, so that it could be sold as such. Western copper-producing companies take account of the gold and silver contained in their blister copper, and figure it is an asset of the company. Thus, the Utah Consolidated Copper Co. in 1905 had an average ore of 3% copper, with 1.3 oz. silver, and 0.10 oz. gold per ton. This, without allowing for treatment losses, would result in a blister copper of 40 oz. silver and 3 oz. gold per ton. Here the precious-metal values are certainly important. The Utah Consolidated report thus gives the cost of producing copper at 9c. per pound; allowing for the precious-metal values, the cost becomes 5c. per pound of copper produced.

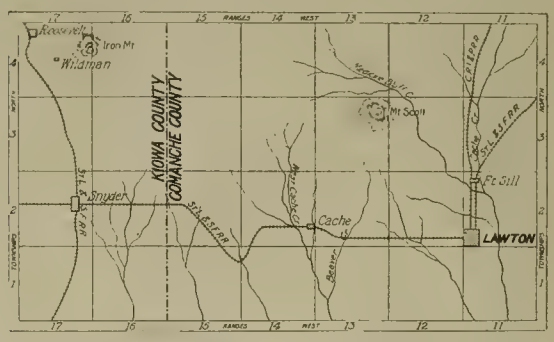
A wireless telegraph system in which the direction of the messages is under control has been devised by Bellini and Tosi, and tested under aid given by the French government. The result has been secured by means of two rectangular aerials fixed at right angles and so attached to the apparatus for reception and transmission as to permit the transmission of unequal currents. These two electro-magnetic forces unite and produce an electro-magnetic field, and the Hertzian waves are projected in a single vertical plane, which can be alternated instantly by means of the Bobine device.

WICHITA MOUNTAINS, OKLAHOMA.

Written for the MINING AND SCIENTIFIC PRESS
By G. W. KNEISLY.

In 1904 eight mining districts were active. Today work is being done in only three localities. Within a radius of two miles from Wildman a number of prospects are being worked intermittently. Southeast of Snyder, on Deep Red creek, washing of gravel for gold is being done. North and northwest of Cache several shafts are being sunk and one or two tunnels are being driven.

The town of Wildman consists of a settlement of about 70 persons. The country rock is a gabbro, cut by numerous dikes of aplite. In places the gabbro has the character of a diabase; in this phase segregations of a hornblendic type occur that look like hornblende dikes. These have been mistaken for veins, and considerable work has been done in prospecting along such formations. The action of water on the gabbro has formed a chloritic mineral, which prospectors have supposed to be due to copper.



Wichita Mountain Region.

Shafts have been sunk. Ore containing chrysocolla, the copper silicate, occurs in small quantities.

Quartz containing gold and silver occurs in a few of the mines, but the ore is not much mineralized, although the owners claim assays as high as $100 per ton. The only shaft that is more than a prospect hole is the Baby. This has a depth of 85 ft., and from it ore running $32 per ton is claimed to have been taken. On a number of other prospects the assessment work is being done each year, but no systematic mining is evident.

No mining is being done in the Snyder district at present, but south and east of the town of Snyder a company is working a placer. The gravel fills the bottom of a small stream. It seems to be a disintegrated conglomerate formed from the erosion of the granite mountains to the north. The gravel is shoveled into a sluice-box by hand and run down a distance of about 200 ft.; it is screened three times, the larger rocks thrown out each time.

North and northwest of Cache a number of prospects have been started. The country rock is a granite filled with minute vugs containing limonite. Dikes of fine-grained porphyry are present, but are not as common as in the Raggedy mountains around Wildman. The ore shows galena and zinc-blende.

ORIGIN OF COBALT-SILVER ORES OF ONTARIO.

By Reginald E. Hore.

*The rapidly increasing proved area of silver and cobalt-bearing rocks of northern Ontario has disclosed new types of deposits, and has afforded additional information regarding the origin of the deposits of the rocks containing them.

The majority of shipping mines are situated in the eastern half of Coleman township, and are therefore within a few miles of the town of Cobalt. The producing veins occur in graywacke and feldspathic quartzites and conglomerates of Lower Huronian age, in metamorphosed, fine-grained, green-colored igneous rocks of Keewatin age, and in gray diabase-gabbro sills of Post-middle Huronian. In the Huronian sediments and in the diabase, the veins are nearly vertical, while in the Keewatin greenstones the inclination is irregular and the veins are less well defined. W. G. Miller suggested[1] that the fissures now occupied by the cobalt-silver ores in the Lower Huronian were probably formed by the disturbance which accompanied the eruption of the diabase and gabbro, and that the ores may have been deposited from highly heated mineral-laden waters, associated with the eruption. In a second edition of this report he has suggested that the ores were possibly leached from the Keewatin greenstones, or from the Laurentian granites. Van Hise[2] also concludes that the diabase is the source of the ore, and believes that the Keewatin and the conglomerate are the main source of the calcite of the gangue minerals. He suggests that the solutions bearing calcium carbonate were a factor in the precipitation of the metalliferous minerals. A consideration of later discoveries seems, in large measure, to confirm the truth of these ideas.

Cobalt is now known to occur in several areas, as follows: in Lower Huronian graywacke, in Casey township, 15 miles north of Cobalt; in diabase-gabbro, in Pense and Ingram townships, 30 miles north of Cobalt; in Whitson and adjoining townships, 25 miles west of Cobalt; in James and adjoining townships, 15 miles north of Whitson; in the vicinity of Portage bay, of Trout lake, and west of Anima Nipissing lake; and in Keewatin rocks, south of Lorrain township, 16 miles southeast of Cobalt.

The detection by the naked eye of scattered smaltite crystals in the diabase, suggests the possibility of its being an original constituent in the rock. On the other hand, the association with aplite suggests that the ore had its origin in the solutions that accompanied these intrusions. Microscopic examination shows that the smaltite is of secondary origin. Accordingly the following conclusions may be drawn: (1) That the smaltite was introduced by solutions associated with the aplite intrusion; (2) that such solutions came after the crystallization of the aplite; (3) that the intrusion disturbed the diabase to such an extent that a zone was formed in the latter which was more permeable to the solutions than was the aplite itself; (4) that these solutions had little action on the feldspars, but found other silicates quite active chemically. Further conclusions may be deduced from a consideration of the origin of the aplite.

The most evident difference between the aplite and the diabase is the color. This is due to a higher percentage of quartz and of alkali-feldspars, and a correspondingly lower percentage of dark-colored silicates, so that the aplite is generally light pink in color, while the diabase is dark gray. Portions of the diabase sill at some distance from the edge are coarse in texture and sometimes pink in color. Here again the difference in color is due to a greater development of quartz and less augite. The distance from the edge of the sheet, and the coarse texture show that these more silicious portions have crystallized later than the main mass. This shows that differentiation has taken place in such a way that the melt has become more silicious, possibly approaching a eutectic mixture. These pink coarse-textured portions have a mineralogical composition intermediate between that of the gray portion and that of the more silicious aplite. From the composition and the field relations it is thought therefore that the aplite is a later secretion from the further differentiated diabase magma. The relation of the aplite to the diabase is similar to that of 'contemporaneous veins' in rocks described by Waller and Teall.[3] It is thought justifiable therefore to apply this term to the aplite occurrences.

It has been shown that the ores were deposited from solutions which followed the aplite intrusions. The origin of these solutions cannot be proved, but the association with aplite suggests a genetic connection. It seems that as the diabase magma cooled and crystallized the melt was approaching a eutectic of predominating salic composition. If water and metallic sulphides and arsenides were being concentrated, this was probably by the formation of a solution whose constituents were not soluble in all proportions in the silicate solution. The former solution was not miscible with the latter, and remained liquid or gaseous after temperatures had been reached at which the latter had solidified. When fractures in the diabase provided means of escape, part of the metalliferous solution doubtless accompanied the aplite solution, and, as has been shown above, part escaped subsequent to the aplite deposition. That such a deposit is due to extreme differentiation in the igneous magma, is in harmony with the expressed views of J. E. Spurr[4] regarding the origin of most metalliferous deposits. While no silver was found in the rock-sections examined, the occurrence of native silver with cobalt minerals in aplite in James and adjoining townships, indicates a similar origin for the silver. While it has been shown that in the veins at Cobalt silver solidified

Economic Geology, Vol. III, No. 7, 1908.

[1] W. G. Miller, Ann. Report, Bureau of Mines, Ontario, Vol. V, 1905.

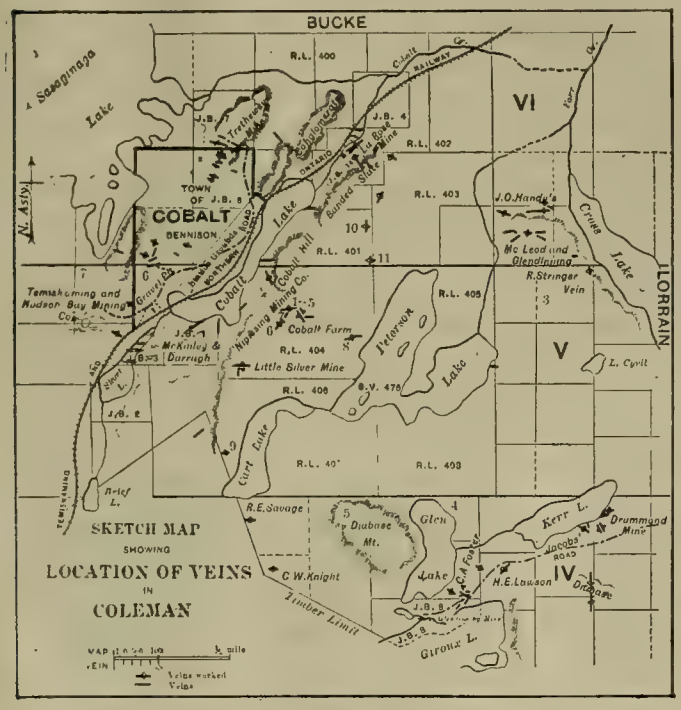
[2] C. R. Van Hise, *Journal* Canadian Mining Institute, Vol. X, 1907.

[3] J. J. H. Teall, 'British Petrography,' London, 1888, p. 275.

[4] J. E. Spurr, 'A Theory of Ore Deposition,' *Economic Geology*, Vol. II, pp. 781-795.

later than the cobalt minerals, the occurrence in the aplite indicates that there was no great time interval.

Having concluded that the cobalt-silver-bearing solutions are the result of differentiation in the diabase magma, we have now to consider the rôle of the intruded rocks in precipitating the ore. Van Hise has stated "that the calcite gangue could not be derived from the diabase since it contains no carbonates, or so small a quantity that it is negligible. But one of the most characteristic features of the Keewatin rocks is the presence of carbonates, among which calcite is the most abundant. Also the conglomerate, being composed of débris from the Keewatin, contains much carbonate." He infers "that the Keewatin and the conglomerate are the main source of the calcite of the gangue minerals," and suggests "that the precipitation of the ores was produced by the mingling of solutions, some of which



Map of Coleman Township.

came from the diabase, bearing the ores, and others of which came from the conglomerate and Keewatin, bringing precipitating agents;" but "the mere cooling of the solution may have been a factor in the process." In the discussion following Van Hise's paper, Miller pointed out[5] concerning the cobalt-silver veins west of Peterson lake, that "in practically all cases the silver values disappear in passing from the conglomerate to the Keewatin, but the smaltite and niccolite continue below the contact." He suggests "that during a period of secondary disturbance the silver filled in the cracks through the smaltite or older minerals." But the older Keewatin "seem to have escaped the effects of this slight disturbance, hence there were no cracks in it, and the solutions could not get through the Keewatin."

[5]*Journal* Canadian Mining Institute, Vol. X, 1907.

A clearer idea of the part played by the intruded rocks is to be obtained by a study of the character of the Keewatin and Huronian formations over the wide area in which cobaltiferous diabase is now known to occur. In Coleman township this formation is represented by igneous rocks only. Perhaps the most abundant type is a fine-grained green rock in which there is considerable chlorite and calcite, and still undecomposed remnants of augite. There are also intrusions of coarser-textured rocks which appear to be altered gabbros and diabases. In Casey township is an outcrop of a dark green, fine-grained rock which apears to be an altered basalt, and in Tudhope township a coarse-textured greenstone intruded by Laurentian granite was observed. In other areas sedimentary rocks are associated with those of igneous character. At Larder lake occur auriferous cherty carbonates, while at Temagami there are carbonates and cherty iron ores. A study of Miller's map[6] shows that none of the veins of economic importance are situated more than a few hundred feet away from the igneous Keewatin rocks. Equally significant is the fact that in areas in which the latter are not found, the cobalt-silver deposits are less extensive, and many cobaltiferous veins contain no native silver. As Van Hise has indicated, these rocks contain a considerable percentage of calcite, which furnished the gangue. It is also to be noted that there are present many relatively unstable minerals, such as pyroxene, hornblende, and biotite, that are readily acted upon by percolating waters. These minerals are active chemical agents, and doubtless by their reactions with ore-bearing solutions aided in the precipitation of the ores. From the field study it seems beyond doubt that such has been the case.

The lower Huronian is represented by graywacke slate, feldspathic quartzite or arkose, and graywacke conglomerate, in ascending order. The strata have, as a general rule, been but slightly disturbed from their original position; but in some places are inclined as much as 45°. Their character has apparently been but little changed by igneous or dynamic metamorphism, except at the immediate border of the diabase where some hardening has taken place by a re-crystallization of quartz.

Bell[7] describes the conglomerate as a volcanic breccia. Miller suggests that "some of the delicately banded graywacke-slate may represent volcanic dust or fine-grained pyroclastic material," but that the lower conglomerate is not pyroclastic and is made up of fragments of the adjacent older series. The examination of thin sections of graywacke shows an

[6]W. G. Miller and C. W. Knight, Map of Cobalt Area, Bureau of Mines, Ont., 1907.

[7]Robert Bell, 'The Cobalt Mining District,' *Journal* Canadian Mining Institute, 1907, p. 64.

absence of glass or mineral fragments charateristic of volcanic dust. The chemical anaylsis shows it to be of a composition similar to an ordinary Paleozoic shale.

	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	FeO	CaO	MgO	Na_2O
A	60.15	16.45	4.04	0.76	2.09	1.41	2.32	1.01
B	62.74	16.94	5.07		1.59	1.39	3.05	6.07

	K_2O	H_2O	CO_2	SO_3	C	BaO	P_2O_5
A	3.60	4.71	1.46	0.58	88.	0.04	0.15
B		3.56					

(A) is a composite analysis of 51 Paleozoic shales, by H. N. Stokes, of the U. S. Geologic Survey.

(B) is the analysis of graywacke slate from the Little Silver mine, made by A. G. Burrows, of the Ontario Bureau of Mines.

The writer concludes therefore, (1) that there was no volcanic activity contemporaneous with the Lower Huronian, (2) that these rocks were formed entirely of the detritus of the Laurentian and Keewatin formations, (3) that the arkoses, at least, are primarily of Laurentian origin.

Attention has already been drawn to the fact that the feldspars were but slightly, if at all, altered by the ore-bearing solutions. Chlorite, sericite, and quartz are well known to be stable minerals, and it therefore follows that the arkoses cannot have been active agents in depositing ores. The graywacke is made up of similar minerals with a larger percentage of secondary products. Calcite is sometimes present in small amounts, and it is noteworthy that these rocks show a marked deficiency in lime, as compared with the Keewatin. It is thought, therefore, that while the Keewatin greenstones have probably, by virtue of their mineralogical composition, played an important rôle in the deposition of the ores, the graywacke, being composed of more stable minerals and low in calcite, played the same rôle in a minor way, if it all. The pebbles in the conglomerate contain numerous primary ferro-magnesian minerals which would be readily decomposed, and so the coarse conglomerate may have been more active than the graywacke slate. Owing to their regular vertical jointing, these sediments have afforded the most suitable place for the deposition of the ore, and so it happens that many of the most valuable veins have been found in them.

Miller has pointed out that marked changes in silver content take place in passing from conglomerate to the Keewatin rocks. Considerable silver is being mined from the latter; but it has in most cases been found that the veins are not so regular as in the overlying shell of conglomerate. The lower limit of the deposits has not yet been determined. There are no borings of more than a few hundred feet, and it is consequently not known whether there is another diabase sill at a lower horizon. Solutions from a lower sill would find in the intruded Keewatin an agent which assists in deposition; but there can be no repetition of the Huronian sediments.

In conclusion it may be said that it has been shown that the cobalt ores have been deposited from solutions which followed the formation of veins of aplite in the diabase. Owing to the fact that in all the silver deposits in the district the silver minerals are intimately associated with cobalt minerals, the silver is believed to have the same origin. It is suggested that the metallic sulphides and arsenides have been concentrated from the diabase magma by extreme differentiation. The Keewatin igneous rocks have assisted in the ore-deposition on account of their content of calcite and unstable minerals. The Huronian sediments are composed for the most part of stable minerals with little calcite, and their chief function has been that of a recipient for the ores. If these conclusions are correct, we may expect to find similar ore deposits where the diabase sills are associated with Keewatin igneous rocks, and especially valuable deposits where Huronian sediments are also present. The region from Lake Temiskaming to Lake Huron doubtless includes many such occurrences.

RELATION OF COPPER TO PYRITE IN BUTTE ORES.

In an article contributed to *Economic Geology* (Vol. III, No. 7), James F. Simpson details the results of applying the system of rock-study known as 'metallography' to the lean copper ores at Butte, Montana. This method, introduced by William Campbell and C. W. Knight at the Columbia School of Mines, New York, consists in dressing a chip of the rock or ore, about one inch square, by the usual methods, finishing the polish on plate glass with rouge. This surface is then examined by a microscope by reflected light, and from the color and solubility when treated with various solvents, chiefly acids, the opaque minerals present are identified. Quantitative determinations may be made by micro-measurement of the etched faces corresponding to the several minerals present. From Mr. Simpson's studies he reached the following conclusions, four facts standing out clearly, namely:

1. Copper minerals can be detected microscopically in all the samples where chemical analysis reveals copper.

2. The copper minerals thus present within or associated with the pyrite are chalcocite, bornite, chalcopyrite, and enargite.

3. The order of deposition of these minerals in the ore is: chalcopyrite, enargite and bornite, chalcocite. The enargite and bornite are closely associated, and from the specimens at hand the exact order of deposition of these two could not be determined.

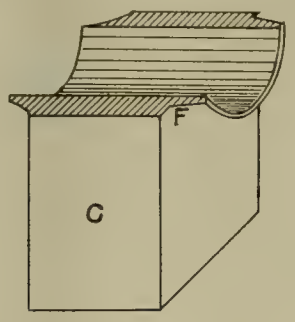
4. Copper is absent from specimens containing no copper sulphide minerals. Therefore the copper is not present in chemical combination with the pyrite of the lean Butte ores, but on the contrary, it is present intimately associated with the pyrite in definite copper minerals of four kinds (chalcocite, bornite, chalcopyrite, and enargite), and these minerals occur in a definite order.

The samples used were selected from the copper mines at Butte. Only those that showed no copper mineral to the naked eye were used, for it was desired to find the relation of the copper to the pyrite in those ores in which the existence of definite copper minerals was unknown. It would, of course, be desirable to know whether the samples used represented ores of primary deposition, or ores largely produced by secondary enrichment.

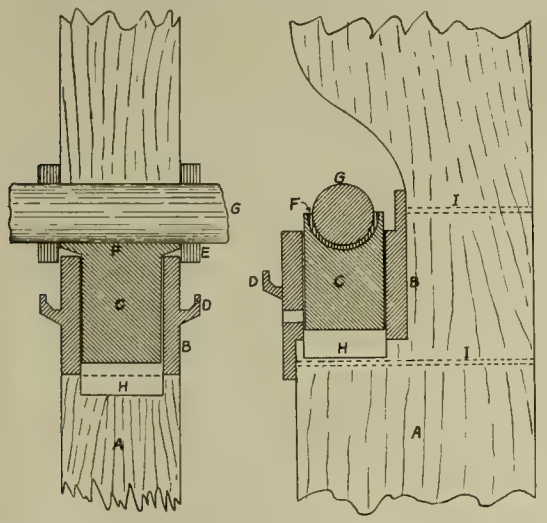
CUSHIONING VIBRATIONS OF CAM-SHAFTS.

Written for the MINING AND SCIENTIFIC PRESS
By ALGERNON DEL MAR.

The vibrations in a stamp-mill are caused by the impact of the falling stamp on the ore between the die and the shoe, and those set up in the cam-shaft when the cams strike the tappets in the act of raising the stamps. The vibrations due to the falling stamps are cushioned to a certain extent by the layer of ore on the die and are confined to the stem and mortar-block and are necessary in this type of



machine. The vibrations of the cam-shaft are very disagreeable. They cause nuts to loosen, bolts to break, cam-shafts to crystallize, cam-shaft bearings to wear out, and so occasion a loss of power. No



attempt has thus far been made to cushion these vibrations.

The drawings herewith shown represent a design I have made to lessen these vibrations and incidentally to afford the mill-man a means of alternating the drop of the stamps without touching the tappets. The proper material for cushions, which will be 8 in. square, is yet a subject for experiment. Pieces of thick belting may serve well. When it is required to lower the stamps, pieces of this material may be taken out and replaced at will. An opening is provided in the front of the chair for this purpose. The dap or gain in the battery post on which the chair sets may be cut in an inch or two and filled with some cushioning material for the cam-shaft bearing, which fits in the chair, but does not touch the chair except on the sides, the bottom of the chair being open. The collars on the shaft should be of sufficient diameter to always bear on the sides of the chair. The lip F on the bearing, which may be called the plug, will keep the grease where it will fall into the receptacle D on the chair, or cotton waste may be used to catch it. The plug is shown solid, but this is not necessary. Manufacturers of stamp-mills should do something to alleviate the miseries of the cam-shaft floor, and these drawings are submitted in hope that the subject may be taken up.

Difference of Style.—In making allowance for the Kaiser's uttered indiscretions, we must remember the German language. Ordinary German prose suffers from a dreadful excess of metaphor. The "mailed fist" and the "loosened sabre" are not altogether rhetorical sparks struck out on the hot anvil of Imperial excitement, but examples of that poetic exaggeration so easy to a German. It is a fault most common among the most learned. Professor Jones, of Yale or Harvard, would probably begin his volume on The Geology of Yucatan: "By Yucatan, in the present work, I mean the Central American peninsula known by that name as well as the adjacent coasts," etc. But Professor Hammerschlag, of Leipsic, must begin by saying: "The convulsive, continent-splitting efforts of *Terra*—or perhaps *Gaia*—to pour forth her imprisoned vital forces brought forth, in the dim Triassic ages, the torrid land-mass which lolls like a sleeping monster between the warm waters of the Caribbean and the torrid waves of the Gulf of Mexico in 87 to 92° west longitude." An English politician speaking in English says: "This country—er—welcomes the—er—friendly rivalry of a great power like Germany under its—er—honored sovereign as—er—conducive to the interests of both nations," etc. But when a German statesman rises to speak, the genius of his language demands that he shall say: "Germania wants peace, but she will continue to stare defiantly into the blood-shot eyes of ravening naval powers who with eager claws," etc.—*The Evening Post*, New York.

Fractionation of crude petroleum by capillary diffusion was suggested to David T. Day by the refining of black vaseline by filtering it through warm, dry, fuller's earth. Experiments conducted by the U. S. Geological Survey showed that when petroleum is allowed to rise in a tube packed with fuller's earth there is a decided fractionation of the oil, the fraction at the top of the tube being of lower specific gravity than that at the bottom. When water is added to fuller's earth which contains petroleum, the oil which is displaced first differs in specific gravity from that which is displaced afterward, when more water is added. When petroleum is allowed to rise in a tube packed with fuller's earth the paraffine hydrocarbons tend to collect in the lightest fraction at the top of the tube and the unsaturated hydrocarbons at the bottom. When oil is mixed with fuller's earth and then displaced with water, about one-third of the oil remains in the earth.

THE KOSAN MINE, KOREA.

By A. D. Weigall.

Kosan is the Japanese pronunciation of the Chinese characters forming the Korean word Kapsan. The mine is situated at the small villege of Ko Djin Dong, 23 miles east of the walled city of Kapsan, in the province of Ham Kyon, in northeast Korea. The distance from the nearest seaport is about 130 miles by road, and the question of transport presents some difficulty, but otherwise the local conditions are good, there being an abundance of excellent timber around the mine; water-power and cheap labor are also obtainable in abundance. The climate is cold, but dry and healthy; the elevation of the mine is 5000 ft. above sea-level.

The mine has been worked continuously for the last 25 years. Three years ago the mine was producing per annum 300,000 lb. metallic copper. At present the output is between 400,000 and 450,000 lb. This copper is mainly purchased by the Japanese and shipped to Japan from the Korean port of Gensan. A small amount of the copper is consumed locally in the manufacture of brass, of which all Korean household utensils are made. Kapsan was one of the mines held as private property by the Korean Emperor, and it is believed to have yielded him a large income, though no figures are available. The mine is well known, and is generally regarded as the most valuable mine in Korea. However, the Koreans had always succeeded in preventing foreigners from examining or securing any interest in it until just before the Russo-Japanese war, when the Korean Emperor granted a concession to the American firm of Collbran & Bostwick, giving them the mine. During the war the Japanese prevented any examination being made, but on the day after peace was signed I left Seoul, accompanied by my assistant, A. H. Collbran, and succeeded in reaching the mine in October, 1905, without being stopped by Japanese troops. This was the first time any white man had seen this mine, though during the war a party of Japanese engineers had examined it.

Knowing the great value of the mine, the Japanese made every effort to secure possession of it, and for three years the Japanese Government has opposed Messrs. Collbran and Bostwick's claim. The American Government, however, strongly supported this firm's undoubted rights, and in June of this year finally caused the mine to be transferred to them. I am leaving Seoul in two days time, with an engineering party, to start work at the mines, and we hope by next spring to have the development well under way. The mine at present is only opened up in the slovenly Korean manner, and practically no reserves are blocked out. It, however, presents great promise of being developed into a large producer within the next two or three years.

The Koreans mined and smelted the ore in a most primitive fashion, partly roasting in stalls and smelting in small circular clay furnaces, using charcoal for fuel, draught being produced by a Chinese windbox. The ore is practically self-fluxing, a basic slag being produced containing 23% silica and 2% copper. This slag is run into pits dug close to the furnaces, and there must be many thousand tons of it buried at the mine. The metallic copper produced has an average composition as follows: copper, 98.02%; gold, 3.2 dwt., and silver, 2.24 oz. per ton of copper.

The deposit consists of large irregular bodies of massive sulphides, occurring in a highly metamorphosed limestone of Paleozoic age. The orebodies roughly follow the dip of the limestone, replacing it along the stratification. The deposits are found in the neighborhood of intrusions of diabase or gabbro, with which their origin is undoubtedly connected, and the formation comes under the head of metasomatic deposits. The boundaries of ore and limestone are sharply defined. The ore consists of a mixture of chalcopyrite, arsenopyrite, and iron pyrite, without any gangue or contact minerals. Its average composition is as follows:

	%
Moisture	0.20
Silica	0.60
Sulphur	41.78
Iron (metallic)	39.10
Copper	11.80
Aluminum oxide	1.80
Arsenic	2.75
Lime	0.50
Magnesia	0.36

The appearance of the ore shows rounded grains of iron pyrite surrounded by copper sulphides, leading to the conclusion that there has been some alteration of the original ore, which must have mainly consisted of iron pyrite. Near the surface the ore was composed of various oxidized copper minerals. I obtained a specimen, about 3 by 1 in., of native copper from one of the miners, who informed me that in the early days of the mine such specimens were not uncommon. Much of the surrounding country to the north of the mine is covered with a surface flow of basalt, which came from the well known Paik Tu San (Ever White mountain), the extinct crater of which is now a lake, forming the source of the Yalu river.

Besides the Kapsan mine, there is another copper deposit of less importance in North Pyeng Yang province, near the town of Hu Chang. This property had been formerly worked by Koreans, but it has been shut down for some years. Other than the two above mentioned properties there are at present no copper deposits in Korea that show promise of being developed into important producers, though copper is found in many parts, particularly in the south, mostly as small and narrow quartz veins, sometimes high-grade in copper.

While on the question of copper mines, you will probably be interested to hear something of a mine at Tien Pao Shan, in southeast Kirin province, in Wen Chun district, about 80 miles north of the Korean frontier, on about Lat. 43° N. and Long. 129° E. This mine has been extensively worked by Chinese, but is now shut down. It, however, presents some promise of being developed into a copper mine of importance. At the time I examined this mine, two years ago, the depth of surface soil and the dense

scrub and grass hampered any geological work. In the neighborhood of the mine the country mainly consists of granite and limestone. There are many loose pieces and float stones of a decomposed acid eruptive rock lying around, but I could not, in the time at my disposal, find it in place. Some distance away from the deposit a fine-grained intruding granite was seen, but probably this has not an important bearing on the ore deposit. The main deposit consists of a quartz lode wholly contained in granite, a few hundred feet away from the granite-limestone contact which it follows. Besides this lode, there are bunches or irregular deposits of sulphide ore in the limestone close to the granite. The width of ore in the granite-enclosed lode is about five feet, the ore consisting of chalcopyrite, bornite, and oxidized copper minerals, iron pyrite, galena, and oxidized lead compounds. Silver minerals are probably also present in small amount. The gangue is composed of quartz. The ore contains about 7% copper and 15 to 20 oz. silver per ton. The Chinese worked it as a silver mine, carefully sorting out the argentiferous galena and smelting it in primitive clay furnaces. The irregular bodies of sulphides in the limestone are poorer in copper, averaging about 2%, but richer in silver, averaging about 30 oz. per ton. They contain no gangue and contact minerals are absent.*

Open-hearth steel rails will soon be used exclusively on the Long Island lines of the Pennsylvania railroad, a first order for 900 tons, for 1909 delivery, having been placed with the Bethlehem Steel Co. The change from bessemer to open-hearth rails will not interfere with the usual distribution of Pennsylvania's rail order, as all leading companies make open-hearth rails. Many rail-makers have been putting in open-hearth plants to meet the views of railroads which desired to change from bessemer. It is expected that the rails will cost $2 to $3 per ton more than bessemer. A number of railroads have been experimenting with open-hearth rails for several years with such good results that many engineers believe it only a question of time when every road will more largely use them. This recalls the prophetic statement of the late Alexander Holley that the open-hearth process would live to attend the funeral of the bessemer. It should be noted, however, that the makers of bessemer steel are introducing dry-blast to mitigate the evils of variable quality which moisture in the air occasions.

Contrary to the usual custom in crushing for concentration, stamp-mills are quite extensively employed in Cornwall, England, for reduction of tin ores, the mineral being so finely disseminated as to render this good practice. The ores at the South Crofty mine may be taken as typical, averaging about 25 lb. tin and 12 lb. wolfram per ton, with 0.25% copper and 15% arsenic, the gangue consisting essentially of quartz, feldspar, mica, tourmaline, chlorite, and fluorspar.

*The foregoing description is taken from a letter sent to Mr. W. H. Weed, who sent it to the Editor.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

QUIETING TITLE TO MINERAL LACHES.

The purchaser of minerals from the owner of the surface immediately caused his title to be placed on the land books of the county for taxation, and continuously thereafter for more than 21 years paid taxes thereon; and during this entire period he occasionally visited the land for the purpose of seeing that there was no actual adverse possession, and not learning of any adverse claims he relied on the covenants of general warranty in his deed for the perfection of his title. Under such circumstances he was not guilty of laches, where he had no knowledge that the owner of the surface was claiming any interest in the minerals until within a year before the institution of the suit.

Steinman *v.* Jesse (Va.) 62 Southeast 275, Sept., '08.

ADVERSE POSSESSION.

Adverse possession of the surface of lands containing minerals does not necessarily include possession of such minerals, where the title to the minerals has been severed by deed from that of the surface.

Yellow Poplar Lumber Co. *v.* Thompson, (Va.) 62 Southeast 358, Sept., '08.

TITLE TO MINERALS—SEVERANCE FROM OWNERSHIP OF SURFACE.

The general presumption is that the possessor of the surface also has possession of the subsoil. But when, by conveyance or reservation, a separation has been made of the ownership of the surface of the land from that of the underground minerals, the owner of the former can acquire no title to the latter by his exclusive and continued enjoyment of the surface; nor does the owner of the minerals lose his right of possession by any length of non-usage. To lose such right he must be disseised, and there can be no disseisure by an act which does not actually take the minerals out of his possession.

Yellow Poplar Lumber Co. *v.* Thompson, (Va.) 62 Southeast 358, Sept., '08.

CONSTRUCTION OF LEASE.

A coal lease defined "pea" coal "to be coal which passes with the dirt through a screen of three-quarters of an inch mesh." Under such lease the lessee could not avoid payment of royalties on coal known as "buckwheat", "rice", and "barley" coal, although all of these pass through a screen of three-quarters of an inch mesh.

Glick *v.* Lehigh Valley Coal Co., (Pa.) 70 Atlantic 810, May, '08.

OIL LEASE—RIGHT OF LESSEE.

The lessee in an oil lease giving him the exclusive right to explore for oil in the lands described, has a right of action for damages against one who invades his exclusive right by entering upon the land during the life of his lease without his consent, and drills wells and removes and sells oil therefrom.

Backer *v.* Penn Lubricating Co., 162 Fed. 627. June, '08.

OIL LEASE—CONSTRUCTION.

An ordinary oil lease, giving the lessee the exclusive right to explore for and sell oil from the land on payment of a stipulated royalty, does not give to the lessee the title to the oil in place.

Backer *v.* Penn Lubricating Co., 162 Fed. 627, June, '08.

MINING CORPORATION—COMPENSATION OF OFFICERS.

A director of a mining corporation who held the office of secretary was not entitled to compensation for services as such secretary, in the absence of any provision in the charter or by-laws, or a contract in advance to that effect.

Silverton Co. *v.* Houghwout, (Colo.) 96 Pac. 975, July, '08.

DISTRIBUTION OF THE NATION'S MINERAL WEALTH.

By Geo. Otis Smith, Director.

*The subject eminently fits both the place and the occasion. The city of Pittsburg, rightly termed "the world's industrial wonder," is founded on the mineral resources of not only Pennsylvania but indeed of the whole country, while you members of the American Mining Congress represent the industry that has enabled this nation to realize a rich income from its mineral heritage. Nor is it inappropriate that a representative of the United States Geological Survey should bring to your attention facts relating to the distribution of this mineral wealth. In the 30 years since its organization this Federal bureau has recorded the development of the mineral industry, and to indicate how phenomenal has been this development, I need only site the fact that during these three decades the mineral production of the nation has increased six-fold.

We should not leave this topic of the 30 years' development without mention of certain notable features in the growth of the mineral industry. In 1880 the non-metallic products constituted 47% of the total mineral production of the country; in 1907 fully 57%. This increase in relative importance of the non-metallic products has not been regular, inasmuch as metals have exhibited a tendency to be more quickly affected by general business conditions, with the result that for the year 1894, for instance, the non-metallic percentage rose to 65%, and again in 1904 to 63 per cent.

The pages since 1880 can also be studied in another manner. Then, in order of value of output, coal stood first, with iron second, followed by gold, silver, petroleum, lime, building stone, copper, lead, and salt. In last year's production, after coal and iron came copper, clay products, petroleum, gold, stone, cement, natural gas, and lead. You will note that in this column of the ten most important mineral products, coal, iron, petroleum, and building stone have maintained their relative positions notwithstanding the six-fold total increase. Copper has advanced from eighth to third place, and gold has dropped from third position to sixth, lead from ninth to tenth, and silver to just behind lead. The newcomers in the 1907 list, as contrasted with that of 1880, are clay products, cement, and natural gas.

The distribution of mineral wealth depends on geologic factors, and different geologic provinces are characterized by deposits of different minerals. Herein lies the value of much of purely geologic study. Thus an important part of the Survey's work through these years has been to keep the country informed as to the occurrence of economic minerals. Not only has the Survey statistician been recording the increasing activity of mine, furnace, and smelter, but the Survey geologist has been mapping and measuring the nation's mineral deposits and investigating the possibilities of new discoveries of the mineral fuels and ores. In the last few weeks the result of this great inventory which it has taken years to make has been brought together in the report submitted to the National Conservation Commission, and it is the existence of these quantitative data that enables me to discuss this important subject at all adequately.

The facts of the distribution of mineral wealth are of practical value because of the vital connection between such geographic distribution and the development of manufactures and commerce. I give precedence to manufactures because this industry, rather than commerce, should first feel the creative influence of mineral wealth. The metallurgical, clay-working, structurel, and chemical industries constitute the web and woof of industrial prosperity, and to a large degree it is only the disregard of the principles of political economy that permits the export of raw material beyand the boundaries of State or nation. Free trade among the States of this union has developed inter-state and internal commerce on a grand scale, but this phenomenal national development should not blind the people of the individual States to the advantage of local utilization of their own mineral resources. As an illustration of this, the new industrial South is possible because the South has always possessed mineral wealth. With these Southern States mining nearly 7% of the iron ore of the United States, and over 21% of the coal, it is simply obedience to natural laws that the Southern furnaces should produce 10% of the pig-iron of the country. Economic laws must be recognized, and the fact of distribution and production—of supply and consumption—must be in mind before we can at all comprehend the interrelation existing between all branches of the mineral industry to plan intelligently for its future development.

Let me cite a few characteristics of the distribution of our mineral wealth. In the first place, the widespread distribution of raw material makes possible an industrial nation in which every State and Territory has some share in the mineral production. Last year only three States had a mineral output valued at less than a million dollars, and 12 States had a production valued at over fifty million dollars each.

Again, no State or region appears to have a monopoly of the mineral industry. While "progressive Pennsylvania," with its total mineral product nearly one third that of the whole country, leads in coal, cement, stone, and natural gas by large margins, another State, Minnesota, leads in iron ore; another, Arizona, in copper; another, Ohio, in clay products; Oklahoma in petroleum, Colorado in both gold and silver, and Missouri in both lead and zinc. Furthermore, these centres of production are ever shifting.

For instance, in 1900 the primacy in quantity of petroleum produced passed from Ohio to California, thence to Oklahoma, and within a year Montana in copper production has given place to Arizona; in lead, Idaho to Missouri, and in silver, Montana to Colorado. It is evident that we cannot prophesy future progress of the industry unless we can determine the centres of the mineral reserves, for it will be toward these centres that the industry will trend.

*Abstract of address delivered before the American Mining Congress by the Director of the U. S. Geological Survey.

PREVENTION OF INE ACCIDENTS.

Soon after the adjournment of the last session of the American Mining Congress a series of unusually disastrous explosions in coal mines of West Virginia, Alabama, and Pennsylvania called the attention of the general public as well as of the mining fraternity to the subject of accidents as it has never been called before. Consequently, much attention has been given to the subject during the past year both in the public and in the technical press, and a large amount of experimental work has been carried on by individuals and by corporations since the close of the last session Congress. These accidents probably also hastened the establishment of a Government Testing Station and assisted in the securing of an appropriation for the investigation of mine accidents in the United States by the Technologic Branch of the United States Geological Survey.

As a result of the widespread publicity given to the subject of accidents through the public and the technical press, and through various mining organizations, together with the organization of a Testing Station and the development of a distinct organization to investigate accidents by the Technologic Branch of the Geological Survey, it was unnecessary for your committee to attempt to carry on work along the lines for which it was originally appointed, as the work would have paralleled that already being done by others.

It being entirely probable that this work, both public and private, will continue, we recommend the discharge of the committee, and in so doing would make the following comments:

We believe that the prevention of accidents depends upon (1) a realization of the relative importance of the various known causes to which accidents can be attributed, so that suitable preventive measures can be adopted to minimize as far as possible the accidents due to these known causes. Under normal conditions in coal mining from 50 to 60% of the accidents are due to falls of rock and coal, about 16% to the explosions of gas and dust, and an almost equal number, or 14%, to mine-cars. Owing to the large number killed at one time by explosions, this cause of accident has attracted more than its due share of attention, and while not wishing to minimize in any way the importance of the attempts made to lessen the dangers due to gas and dust, we most earnestly urge that more attention be given to the great cause of mine fatalities which is everywhere present, namely, falls of slate, coal, and rock. (2) The scientific investigation of the problems connected with mining both theoretical and practical, and which are now only partly understood, should continue. The most important of these are probably the choice, handling, and use of explosives; problems connected with explosive gases and dust in coal mines; better supervision and more careful timbering to prevent the great loss of life and the accidents due to falls of rock and coal.

The training of vast numbers of immigrants from southeastern Europe who are so rapidly replacing the former mining population and who come to us with no knowledge of mining is one of the serious problems affecting the accident conditions in this country.

The conditions under which American mines are operated must be kept distinctly in mind, and the vast differences between European and American conditions must be remembered in comparing the statistics of accidents abroad and in American mines.

We believe that the mine laws now on the statute books, if enforced and respected by employer and employee alike, are sufficient in many cases to greatly reduce the number of accidents. There are no doubt instances where the laws can be modified to advantage to conform to present knowledge and conditions, but these modifications should be made by persons familiar with the conditions under which American mines must be operated, and who also understand the theory and practice of such new forces as electricity, compressed air, etc., that now play so important and necessary a part in mining. A greater uniformity in the mine laws of the different States where the conditions are similar would be advantageous.

We believe that experience in one State should be allowed full credit in another for a person applying for a certificate as mine foreman, manager, etc., provided he can satisfy the requirements of examination as provided for in the State in which the application is made.

We would also call attention to the fact that several persons are injured for every one killed, and we believe that a useful work can be carried on in assisting those injured about the mines through the use of intelligent first-aid measures. The various devices used in case of rescue work after an accident will undoubtedly be tested at the Government Testing Station, as has been done abroad, and as the result of these tests become known it is to be expected that more adequate means for rescue in case of explosion, fire, etc., will be installed at many of the mines. The circumstances requiring such apparatus are, however, fortunately comparatively rare, while every day men are being injured more or less severely about the mines. The rendering of efficient first aid to such men while awaiting the arrival of a physician may mean in many cases the saving of life or the prevention of permanent deformity. We would therefore especially call attention to the very thorough first-aid organizations which have been developed in the anthracite mines of Pennsylvania.

*Report of H. Foster Bain, as chairman of committee appointed by the American Mining Congress.

Purification of mercury, according to Bettel, may be accomplished by using a 2% solution of KCy with addition at intervals of a little Na_2O_2. The ordinary impurities are thus completely removed from Hg. While the base metals are being dissolved (which in a case cited required about four days) but little gold was removed. After that the removal of gold was fairly rapid, diminishing, of course, in speed as the proportion of gold became less.

Lea-Degen Centrifugal Pump.

The general design of the Lea-Degan pump, made by the Lea Equipment Co., of New York, is shown in the drawing. It consists essentially of two shrouded runners, or pump wheels, mounted on the same shaft in a double case. The case is so partitioned that the water is drawn from the source of supply and put under pressure by the first wheel, and then delivered to the suction chamber of the second wheel. The second wheel then imparts to the water the same amount of energy it receives from the first wheel, thereby increasing the pressure, and then delivers the water into a spiral discharge conduit terminating in a diverging nozzle connecting with the main pipe. The dimensions of a pump recently tested were: diameter of suction pipe, 10 in.; diameter of discharge pipe, 10 in.; outline diameter of each wheel, 24 in.; number of blades, eight.

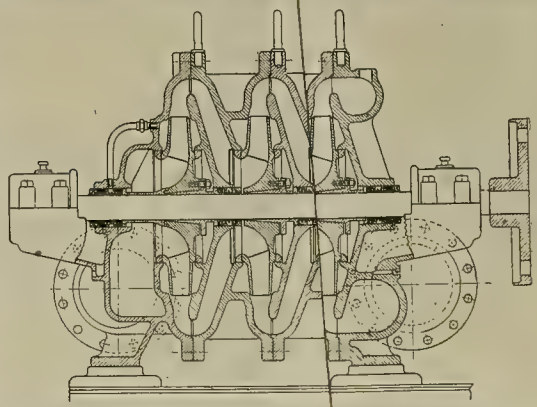
The special features of the pump which represent patented advantages are: (1) The case is divided through its horizontal diameter by bolted flanges so that its top half can be quickly freed, and lifted off, without disturbing either suction or discharge connections, thereby affording easy access to the internal parts of all the stages at once. (2) By means of bolted circumferential divisions of the case, provision is made for either using the suction and discharge end of a case together as a single-stage pump, or for adding as many intermediate sections as may be necessary to afford any desired pressure at any fixed speed. Additional stages can therefore be installed after a pump has been in operation without wasting any parts of the existing case. (3) A special arrangement of double cup-leather packing is used for both the suction and discharge ends and for the intermediate sections. The cup leathers are held against a flat collar, on extended pump-wheel-sleeves, in such a manner that the leathers can follow up as they or the collars are worn, or the shaft may be shifted at will in either direction, with the leathers following, without changing the location of the leather with relation to the shaft collar, thus making a practically water-tight joint at all times. A spiral spring is used, between each pair of cup leathers, to ensure their seating against the collars before pressure is put on the pump. Provision is made for setting out the leather packing on the suction end of the shaft by the water pressure of the high side of the pump. (4) On the outside of the main bearings, at each end, is placed a ball thrust-bearing, with adjusting collars, for shifting the shaft endways to balance the end-thrust of the pump-runners. The balancing is accomplished by means of variation in the width of water-space, on both sides of the wheels between the rim of the wheel and the case. Experiment showed that as the wheel was moved laterally in the case, the pressure between the wheel and the case increased on the side where the clearance was greatest, and was reduced on the opposite side.

The pump tested was driven by a General Electric, direct-current multi-polar dynamo of 385 amperes and 220 volts used as a motor, and direct-connected to the pump-shaft. It was arranged to lift water by suction, about 7 ft., from a well, and to deliver it through a 10-in. throttle-valve to a 6½-in. bell-shaped nozzle, to a weir-tank, which was about 25 ft. long by 10 ft. wide and 10 ft. deep, whence the water flowed through a rectangular notch 3.02 ft. wide in a ¼-in. beveled iron plate set in the middle of the end of the tank about 7 ft. above the bottom. A pitot tube was applied under the nozzle, and its indications used as a means of quickly adjusting the discharge of pump to the several amounts of flow necessary for the tests. The amount of water flowing was calculated from the weir height by the Francis formula.

The weir heights were taken with a hook-gauge in a barrel communicating with the tank by an inch pipe having an open end square with the flow of water at a point 13 ft. back of the notch. The surface of the water approaching the weir was made perfectly smooth by means of a grill-lattice 6 ft. from the discharge nozzle, and dam-boards set by trial. The zero of the hook-gauge was determined daily with a straight-edge, and checked by a surveyor's level. Readings of the gauge could be easily made to $^1/_{64}$ of an inch. The leakage of the weir was frequently determined. It remained practically constant at 18 gal. per minute, which was added to the quantity calculated by the weir formula. The total lift of the pump was determined by adding the vacuum shown by mercury gauge to the pressure above the atmosphere shown, the pipe diameter being the same as both points.

The pump was designed by Mr. Degen for practically equal efficiency for the range of speed between 400 and 600 rev. per min. Therefore an efficiency-test was made at 400, 500, and 600 revolutions, respectively.

No data were recorded at a speed varying more than two revolutions from the assigned speed, a skilled assistant devoting his attention to this point. After the gallons-lift curves were secured, the pump was disconnected from the motor, and the power of the latter absorbed by a prony brake over the same range of watts applied to drive the



motor during the pump tests. From these curves the horse-power corresponding to the watts applied to drive the motor during the pump tests was determined and taken as the horse-power to drive the pump.

The prony brake was of the two-semi-circular, solid-block type, applied to a 28-in. pulley, with 6-ft. lever-arm acting on a knife-edge on tested platform-scales. It was carefully balanced with its pulley by mounting the whole combination, with a mandril through the pulley, on straight-edges. A copious stream of water applied to a nipple in the top block, through a long vertical flexible hose, and a hand-tightened wheel, with a leverage of 1000 to 1, enabled the highest loads to be maintained indefinitely with a steady equipoise of the scale-beam. The electrical readings were made from a Weston instrument from the laboratory of the Stevens Institute.

The tests, which were made by J. E. Denton, Professor of Engineering Practice at the Stevens Institute of Technology, Hoboken, N. J., show that the pump afforded the following results under conditions of maximum efficiency:

Revolutions.	Efficiency, %	Capacity, gal.	Lift, ft.
400	77.70	2216	43.6
500	77.60	2794	67.4
600	77.97	3235	100.7

In round numbers, therefore, the capacity at maximum efficiency is directly proportional to the revolutions, and the lift, or head, is proportional to the square of the revolutions. At each speed the efficiency averaged more than 76% over a range of 600 gal. capacity for the lower two speeds, and 900 gal. at the higher speed, the head remaining nearly constant.

To test the effect on the end thrust of altering the clearance, pipes were tapped into the case, on either side of the high wheel and connected to the two ends of a U mercury-tube. With the shaft in the position, in which it had been adjusted for the test, there was no difference of pressure shown by the mercury.